# COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Weekly Newspaper  Second-class postage paid at Boston, Mass., and additional mailing offices



Price: $12/year  November 20, 1974  Vol. VIII, No. 47




CW Photo by V.J. Farmer

Highlight of the ICL booth was its 2903 computer system.

# ICL 2903 to Enter U.S.; Billed as S/3 Competitor

By Vic Farmer
Of the CW Staff

MONTREAL – ICL Ltd. introduced its 2903 computer system to North America at the Canadian Computer Show and Conference here last week.

Although 90 other exhibitors were here, there were several firms representing two, three and even seven U.S. manufacturers making the equipment on display quite large.

Pegged to compete with IBM's System/3 line, the ICL 2903 will be introduced in New York this week. However, ICL is planning to limit sales of the 2903 to the greater New York area at first.

The small computer system was originally introduced 18 months ago in Europe and to date the firm claims orders in excess of 750 systems and installations in about 275 sites. Two 2903s are installed in New York, one at ITT and one at Nat Sherman, a tobacconist.

The 2903 system employs integrated circuitry and microprogramming. Main memory is MOS semiconductor and ranges from 16K to 48K 24-bit words. Cycle time is 1,140 nsec, ICL said.

Up to eight data entry CRT stations can be used and eight additional CRT terminals can be attached as options to access a data base.

Through use of a Telephone Data Terminal Facility the system can be used as intelligent satellite to a larger system, specifically to an IBM 370 CPU, ICL said.

The fixed and exchangeable disk drives have a minimum storage capacity of 10M characters and disk storage can be expanded to 250M character.

Line printers are available that range from 300 line/min of 132 char./line up to 1,100 line/min..

Other peripherals available include magnetic tape units, card readers and punches, and paper tape readers and punches.

The four languages available are: RPG II, Cobol, Fortran and Algol.

### Customer Centers

ICL operates partially bundled and one of the prime reasons it is limiting U.S. sales to the New York area is its need to set up customer centers. The three customer centers in North America will be located in New York, Toronto and Montreal.

ICL claimed users who have signed contracts will be able to get RPG II language training, operator training, program testing and systems support at no additional

*(Continued on Page 4)*

## On the Inside This Week



## ACM's Turing Award Winner:

# No Single Style Superior In 'Art' of Programming

By Don Leavitt
Of the CW Staff

SAN DIEGO – The programmer is, and should be, an artist, if the true meaning of the word "art" is understood and the programmer appreciates his responsibilities, Prof. Donald Knuth told the Association for Computing Machinery (ACM) as he accepted the group's highest honor, the A.M. Turing Award.

Acknowledging that the goal of ACM publications has generally been to turn programming into a science, he argued that the goal was a false one, even though the basis of programming might depend on scientific principles. The application of such principles is an art, he stressed.

The scientific approach is characterized by calm, restrained, rational behavior devoid of any immediate value. Programming, on the other hand, is an art form in an aesthetic sense. Preparing a program, Knuth said, is "like writing poetry or music. It must follow often complex but consistent rules to be effective and satisfying."

Program listings can be elegant, exquisite or sparkling – "perhaps even 'noble' " – and style is coming to the fore at last. There is, however, no one "best" style; no one should force anyone else into working in a style that is unnatural to him, the professor added.

While there should be no rigid rules to define "good" or "bad" style, there tends to be one basic consideration that tells the programmer whether his work is good or bad. The utility of the resulting program, even if it does an essentially playful job, is a valid rule of thumb, he said.

Author of three volumes of a planned seven-volume series on the art of computer programming, Knuth said programmers have "good" style if their programs work and if they are easily changeable as requirements change.

They should also "interact gracefully with the user," including the use of "pleasant messages to the operator" and input requirements that are reasonable to meet. The coding should be efficient, but not at the cost of added complexity of logic, he added.

Other ACM coverage on Pages 2–9.

"Premature optimization is the root of all evil [for the programmer]," Knuth quipped in an aside, "even though there is a time and a place for efficiency." Good programmers, he noted, enjoy accomplishing something working with limited tools. "That is why so many programmers really enjoy working with minis, especially after a project on a large mainframe."

Programming chores may not all be "fun," he said, but even routine jobs can be pleasurable, and more effectively done if the programmer has good tools.

Speaking for the application programmers, he pleaded with systems programmers, "Give us tools that are pleasant to work with, not things that we have to fight with." Some of the features now available might be good, he admitted,

*(Continued on Page 2)*

# Standards Effort, User Needs at Odds

By Edith Holmes
Of the CW Staff

SAN DIEGO – Movement toward a workable trade-off between the establishment of standards and the recognition of user needs in developing interactive programs remains in a primitive state, panelists at an ACM '74 session here agreed last week.

"Most 'user-oriented' interactive programs rely on both the characteristics of the particular hardware/software configuration for which they have been developed and a set of ad hoc techniques which the program designers have implemented to provide a workable man-machine interface in that environment," Anthony I. Wasserman of the University of California at San Francisco and chairman of the panel explained.

Problems arise because "these techniques are poorly documented and there are no programming language standards for the development of conversational programs," he added.

As a result, Wasserman noted, the level of user-orientation to interactive programs varies greatly and it is difficult to transfer programs among different computing installations.

### Considering the User

Speaking to systems designers in particular, Richard L. Venezky of the University of Wisconsin accepted what he called "a legitimate challenge to show that user-oriented programs are necessary and important.

"Ultimately, systems people design for everyone, but two specific kinds of users should be considered: special users, who have some programming knowledge and who are interested in the content of what their systems will be doing, and general users, who will tend to define what they want their system to do in basic computer terms," he said.

Venezky noted users can be further identified as those who operate on a casual basis and those who run their systems around-the-clock.

Systems should be designed to accommodate the special and the general user, the user who goes to the system infrequently enough to forget how to operate it and the user who employs his system so

*(Continued on Page 2)*

# GAO Blasts Poor Documentation In Government's DP Projects

By Nancy French
Of the CW Staff

WASHINGTON, D.C. – Millions of taxpayer dollars and years of programming effort are being wasted due to poorly documented computer programs within the Federal Government, according to a recent report of the General Accounting Office (GAO).

Of 710 data processing professionals in more than 70 federal computer installations who responded to a recent GAO survey, 478 reported excess time is required to modify existing programs, 341 reported difficulty in evaluating internal controls and 272 reported management review problems.

To meet target dates, the report said, many programmers admitted omitting documentation altogether or preparing incomplete documentation.

Manpower limitations make it difficult to document modifications on a timely basis, the report said.

Programmers said they "use their own judgment" when determining what documentation to prepare for each program rather than adhering to any agency standards.

Without good documentation, according to the GAO report, auditing a system

*(Continued on Page 5)*

COMPUTERWORLD
THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY
TM Reg U.S. Pat Off

EDITORIAL
Editor — E. Drake Lundell Jr.
Managing Editor — Thomas Geyer
Associate Editor/ Technical News — Ronald A. Frank
Hardware Editor — Victor J. Farmer
Software Editor — Donald Leavitt
Assistant Editor/ Computer Industry — Molly Upton
Staff Writers — Nancy Freneh, Edith Holmes, Patriek G. Ward, Toni Wiseman
Chief Copy Editor — Judith Kramer
Copy Editors — Cheryl M. Gelb, John P. Hebert
Editorial Assistants — Catherine Arnst, Ann Dooley
Bureaus:
West Coast — Marvin Smalheiser
Europe — J.H. Bonnett
Asia — Hidetsuna Sasaki
Contributors:
Edueation — J. Daniel Couger
Taylor Reports/Professional Praetiees — Alan Taylor
Vice-President/ Editorial Serviees — Edward J. Bride

SALES
Vice-President/ Marketing — T. Neal Wilder
Sales Administrator — Dorothy Travis
Traffie Manager — Judy Milford
Classified Advertising — Sara Steets
Market Researeh — Kathryn V. Dinneen

CIRCULATION
Vice-President/ Cireulation — Margaret Phelan
Assistant Manager — Barbara Jeannetti

PRODUCTION
Manager — Leete Doty
Supervisor — Henry Fling

Please address all correspondenee to the appropriate department at 797 Washington Street, Newton, Mass. 02160. Phone: (617) 965-5800. Telex: 92-2529.

OTHER EDITORIAL OFFICES: Los Angeles: 963 N. Edgeeliffe Drive, Los Angeles, Calif. 90026. Phone: (213) 665-6008. Europe: Computerworld, e/o IDC Europa, Ltd., 140-146 Camden Street, London NW1 9PF, England. Phone: (01) 485-2248/9. Asia: Computerworld, e/o Dempa/Computerworld Company, Dempa Building, 1-11-15, Higashi Gotanda 1-chome, Shinagawa-ku, Tokyo 141. Phone: (03) 445-6101. Telex: 26792.

Second-elass postage paid at Boston, Mass., and additional mailing offiees. Published weekly (exeept: a single combined issue for the last week in Deeember and the first week in January) by Computerworld, Inc., 797 Washington St., Newton, Mass. 02160.


50 eents a copy; $12 a year in the U.S.; $20 a year for Canada and PUAS; all other foreign, $36 a year. Four weeks notiee required for ehange of address.



*Computerworld* ean be purchased on 35mm microfilm in half-volumes (six-month periods) through University Microfilm, Periodieal Entry Dept., 300 Zeeb Rd., Ann Arbor, Mich. 48106. Phone: (313) 761-4700.

COMPUTERWORLD, INC.
President/Publisher — Patrick J. McGovern
Exeeutive Vice-President — W. Walter Boyd
Vice-Presidents — Edward J. Bride, Margaret Phelan, T. Neal Wilder
Editorial Director — Dr. H.R.J. Groseh

ABC ABP AIA

POSTMASTER: Send Form 3579 (Change of Address) to Computerworld Circulation Dept., 797 Washington St., Newton, Massachusetts 02160.

## 'Turn Back to Belief in God'

# 'Numbers' Overshadow Human Concerns

By Edith Holmes
Of the CW Staff

SAN DIEGO – Unless the computer industry learns to question its use of numbers and its quantitative view of the world into a perspective allowing for other, more human concerns, it will be left with nothing but numbers, Robert S. Barton, director of engineering for systems research with Burroughs Corp., said at the opening session of the annual conference of the Association for Computing Machinery (ACM) here last week.

"We've built a society based on science, and on the surface that society is full of numbers," he told the audience filling the San Diego Convention Center for ACM '74. "As a result, we rely on our marvelous ability to deal with numbers and logic and to create elaborate computer models to solve our many problems.

"But what we are measuring and modeling really isn't very quantitative. Problems today are characterized by qualitative, nonlinear phenomena that don't fit into the linear models we continue to use," Barton said.

Numbers themselves, while increasingly available, are also increasingly incomprehensible, he remarked. While pocket calculators have made involved calculations more accessible, Barton noted they haven't increased the ability to comprehend large figures.

"Numbers are being degraded, devalued partly because we can no longer see what they mean," he said.

Barton added that numbers are constantly misused, particularly by the trade press. "Both *Computerworld* and *Electronic News* use numbers as though they constituted a sublanguage.

"Some 30% of the words these publications use refer to machine numbers, peripheral numbers, capacities, speeds and performance measurement figures," he commented.

Advocating a different way of looking at numbers and computers, Barton urged the abandonment of the scientific, production-oriented view in favor of a new emphasis on people.

Numbers constitute only one means of viewing the world and "computers should be seen strictly as a medium for facilitating people-to-people communications," he stressed. "Nothing else really matters."

Barton indicated that a redefinition of the place of science and production and of the importance of numbers and computers in society is essential to human survival.

"Ten years ago, I thought we could make the right decisions so long as we could build and test computer models. Five years ago, I began to question that idea. Now I know our situation is quite hopeless unless we rid ourselves of the notion that if we can't measure it, we can't understand it," Barton said.

"Our only hope is to turn away from our belief in numbers, to think more about people and the quality of life, to turn back to a belief in God," he concluded.

# Standards Effort at Odds With User Requirements

*(Continued from Page 1)*

often that he would be both bored and frustrated by extensive prompting, Venezky asserted.

Beyond these general specifications, users must have a definition of the capabilities of the system, he told designers. Users also need to know the operational characteristics of the hardware device used to access their systems, whether the devices are CRTs or teletypewriters.

Venezky emphasized the importance of teaching users how to specify the tasks they want performed and what their most effective means of error correction are.

Users should also be given means of monitoring tasks to determine whether a job has been completed, he said. Finally, they should be instructed in the ways of interpreting their output, Venezky said.

"If we are serious about incorporating standards in interactive programs, we need to standardize error messages, to pursue terminal standards more rigorously, to encourage the inclusion of 'help' and 'information' modes, to develop many levels of system diagnosis and to improve interaction with the system through 'control' and 'prompt' modes and by providing the capacity for immediate interaction with a human being who can at least begin to address a user's problem," he suggested.

### Psychological Factors

In his presentation Wasserman urged systems designers to consider a variety of psychological factors when building a system. He added that none of these factors could be easily standardized.

Designers can improve the willingness of a user to accept a system by involving that user in plans for its design and use, he said. In particular, Wasserman suggested systems people be aware of the threat users may perceive should they fear replacement by an automated system.

He emphasized the importance of user training, stressing the need for separate introductory and reference documentation. "Individualized training has been especially successful," he indicated, "particularly where users train other users."

Wasserman noted the importance to the user of terminal reliability and data integrity and security but suggested "the ease of use or computer system invisibility" is the key to user acceptance."

Building on the remarks made by Wasserman and Venezky, M. Granger Morgan of the Brookhaven National Laboratories and Carnegie Mellon University said research for humanizing computer systems for users, whether they are technically or nontechnically oriented, is still at the basic stage.

"The basic barrier to research in humanizing interactive systems is not funding constraints, but the limited imaginativeness of most proposed research," Morgan remarked.

He concluded the humanization of systems is primarily a problem of engineering design but indicated the design process itself is still in the art form rather than at the scientific state.

The National Science Foundation (NSF) has an active program for developing the man-machine interface, Morgan said. But, he added, "we do need several large federally funded demonstration projects" to illustrate the results of this research.

He suggested NSF's best civil-sector approach to this task would be to fund the best artists, to weigh support toward "low-cost" approaches and to continue to watch for generalized knowledge in order to speed the transition of system humanization from art to science.

Representing the NSF, Robert P. Blanc described foundation efforts through the Arpa network to develop common system command languages, front-end translation for these languages and network access machines which would permit users to define their own command language.

Blanc indicated a combination of these approaches would probably create the best chance for maximizing standards while meeting user needs.

# Programming Viewed as Art Form

*(Continued from Page 1)*

"but they take too much storage."

The implementors of IBM's Job Control Language and other system command schemes were rapped by Knuth for the clumsiness of their requirements. "Imagine spending a fair bit of lecture time telling students that programming is an art form," he said, "and then having to tell them that before the program can be used, they have to punch up a job card."

Hardware designers also felt Knuth's almost cynical challenge. "Why can't we have a floating point processor that follows simple mathematical laws," he asked, "instead of making the mathematician rephrase his needs in some way to meet the processor's requirements?"

Software routines "should not be too automatic," he said, even though libraries are a valid support capability. "Some tasks are best done by machine," Knuth admitted, "but some are best left to the insight of the programmer at the time the coding is needed."

And computer performance evaluation efforts, growing in popularity with management, can and should be shared with the programmers. "Treat them as the people they are. Tell them what is being done inside the computer and why. Most programmers want feedback about the real costs of what they are doing," Knuth said.

Language designers should also encourage application program style, he noted in conclusion, "but none of those in serious use today is really independent enough of data forms and other constraints to be a real help to the programmer."

# ACM to Emphasize Practitioners

SAN DIEGO – Members ot the Association for Computing Machinery (ACM) think the organization should be doing more for "practitioners" of data processing and perhaps decrease the current emphasis on academic issues, an open forum between ACM's members and offices at ACM '74 here last week indicated.

But a long range planning (LRP) committee may have beaten them to the punch.

Jean Sammett, ACM's president said the LRP report, which is ready for presentation to the executive committee and ACM council, recommends that more material be published for practitioners in the organization's regular monthly magazine *Communications* and that a publication devoted strictly to business DPers be started by ACM.

The new publication suggestion received spotty reaction from the audience, but there was general approval of a switch in emphasis toward practitioners.

### How to Implement

The problem in implementing such a suggestion is the makeup of ACM itself and what appears to be a dearth of material submitted to *Communications* and related specifically to business or practitioners' needs.

However, any growth in ACM membership, which has stabilized at around 26,000 in recent years, is likely to come from new people in the business arena, according to ACM's vice-president Dr. H.R.J. Grosch.

ACM's membership in general is probably satisfied with the organization's current emphasis and direction, while the practitioners in the audience represented a minority that will grow as new business people join the association, he predicted.

# CHAMP

# Introducing new SyncSort III:

## The fastest sort of 'em all!

**(Seconded by the finest sort service.)**

## Call (201) 947-8500

Ask about our free six-step sorting survey:

1. Technical presentation in your office.
2. Sort-load analysis.
3. Test outline.
4. On-site demonstration.
5. Tabulation of results.
6. 30-day trial period.

SyncSort III is a breakthrough in sorting technique.

The fastest, most comprehensive sort available. Its new VIRTUAL-SORT technique has been applied not only to all VS systems but to OS and DOS, too.

Efficiency differences between fixed and variable-length sorting have "virtually" been eliminated. You can even sort records greater than track size.

And SyncSort III is backed by the best support service anywhere. (Rated 4.0 — top grade — in a recent survey. Details on request.)

When you call our man Harvey, say, or one of his teammates, you are talking to somebody who really knows the sorting territory. (After all, he helped make the map!)

SyncSort III will cut your IBM timings dramatically. But it's more than just a speed package. Because it makes things a lot easier for a lot of people. By taking some of the blood, sweat, toil and tears out of sorting.

HERE's WHAT SyncSort III CAN MEAN TO YOU:

**1. Fewer operations problems.** (No JCL change.)

- Up to 50% more records in a given disk space.
- Release of excess disk space.
- Secondary allocation.
- Non-contiguous work space.
- Direct communication with an invoked sort.

**2. A tool for managers and analysts.**

- Sort-load profile goes to the manager each month.
- Exception reports to pinpoint inefficient sorts.
- Sets and maintains standards for sort users.
- Structures systems and selects optimum environments.

**3. Unmatched performance on fixed and variable-length records.**

- 30% average time savings on sorts in "OS".
- Dramatic time savings in "VS" (no need to run V=R).
- Significant background savings.
- Marked reduction in I/O accesses and CPU time.
- Reduced CCW overhead through EXCP-VR (VS only).

The OS/VS versions of SyncSort III are ready to go. The DOS and DOS/VS versions will be available late in '74.

Call (201) 947-8500 or write us today. We'll visit your operation and do a professional sorting survey (through SMF analysis), and show you what SyncSort III can do for you in the crunch. There's no cost or obligation. Example sent on request.

**WHITLOW COMPUTER SYSTEMS Inc.** 222 S. Marginal Road, Fort Lee, New Jersey 07024

# ICL 2903 to Make U.S. Entry; Intended to Compete With S/3

(Continued from Page 1)

cost through these centers. The centers will also have a "full" range of facilities including batch processing, direct data entry, multiprogramming and application packages. These centers, ICL said, "should allow a potential user to set up his system programs and train staff prior to CPU installation."

The minimum 2903 consists of the CPU, 16K main memory, 10M-character disk storage, 300 line/min printer and a card reader and will cost $1,860/mo. The systems can be expanded, however, to $7,400/mo with additions of extra memory, disk storage, CRT terminals and other options.

ICL has not yet announced any further upward migration path system in the U.S. for users needing more power, but a spokesman said larger machines will be available within 18 months to two years in the U.S. The price of the smaller 2903 systems is close to IBM's System/3 prices, but the spokesman explained that larger 2903 configurations should average 10% below the price of comparable IBM systems.

In other areas, Centronics announced two 165 char./sec. impact printers, the models 301 and 501. Both machines use either a 5 by 7 or 9 by 7 dot matrix print head to print a format consisting of 10 char./in. horizontally and 6 line/in. vertically.

The 301 is an 80-column wide printer; the 501 is 132 columns wide.

The 301 is priced at $2,255, the 501 at $3,445 with standard Centronics interfaces priced separately.

Prototype Printer

Centronics also had on display a prototype of a 132-column printer that used standard 8-1/2 in. wide paper to see if users showed any degree of interest. Centronics is at One Wall St., Hudson, N.H. 03501.

The show also brought some recently introduced equipment on display for the first time including Interdata's 7/32, a 32-bit word minicomputer, the Data General Eclipse and Modular Computer Systems, Inc.'s Modcomp II, a new version of its line of minis using 32K-word core memory boards.

Trans-Canada Telephone displayed its new Vucom 2 IBM 2260/3270-compatible terminal that operates on its all digital Dataroute. The Vucom 2 is a slightly modified Raytheon Programmable Terminal System, the PTS-100.

CW Photos by V. Farmer

The Canadian Computer Show provided a good cross section of manufacturers' products.

Deborah Kuznitz, an Interdata support analyst, demonstrated the firm's new 7/32 minicomputer.

Trans-Canada Telephone drew interest with its Vucom 2 (Raytheon PTS-100) terminal offering.

# Economic, Ethical Issues Magnify 'Information Crisis'

By Nancy French
Of the CW Staff

SAN DIEGO – The DP industry is in an "information crisis" and will get out of it only after it solves the mechanical and economic questions of how to handle the information and the ethical question of who actually owns the information and how much it is worth, ACM members were told last week.

## CW at ACM

And it will take creation of systems that help rather than thwart the public in obtaining public information and coping with the "explosion" of conventionally published materials before the crisis is finally resolved.

An overflow audience heard panelist Robert Korfhage of Southern Methodist University ask why – "with all the facilities, knowledge and ability we've got to manipulate data" – accurate, timely information cannot be obtained.

## Message Not Same As Storage Medium

SAN DIEGO – There's a difference between information and the media on which it is stored and, when people find out they don't have to move the media around to get that information, part of the "information crisis" will be solved, according to Jack Belzer of the University of Pittsburgh.

Chairman of the ACM's session on the information crisis, Belzer compared present thinking on information storage and retrieval to "breeding a faster horse" instead of developing the automobile.

He called for new solutions, among them "information regeneration."

Libraries, for example, could be reduced by extracting and storing only the essential information from the many books published on any given subject, he said.

In the case of a research project, the information could be stored and then "re-created as needed," he said.

Public and professional apathy is partly to blame, as is "excessive zeal to protect information that should be public knowledge," he explained.

Korfhage suggested forming a "Better Information Bureau" much like a Better Business Bureau to keep tabs on information systems.

Who Owns the Data?

Dr. H.R.J. Grosch, ACM vice-president, believes the information crisis is not merely an issue of privacy and security but rather a matter of "the value of information and the ethics of information storage and retrieval.

"It's not just a matter of the department store making sure your bill is right or that your FBI file or a juvenile delinquent child's file be in order. The question is who owns the information?" he said.

"Personal data should be the property of the person about whom the information pertains – whether it's fingerprints, criminal records, marital history or employment record," Grosch said.

"Giving it away to a department store or anybody else is a 'one-time' favor. Others have no right to give that information away or to sell it.

"But no law existing recognizes this principle," Grosch sighed.

When we release that information, we should be asking ourselves not only how many bits do we get for the buck but, rather, should we release the information at all, is the information ours to release and how much should we charge, he added.

Library Problems

Shifting to another area of concern, Gerald Salton of Cornell University noted that libraries, the present day centers for information, are "bursting at the seams.

"There is too much information to store, it's too expensive to inquire and we don't have the equipment to store it if we could afford it," he said.

"We're farther from, rather than closer to, the concept of the 'intellectual Cadillac' proposed about 10 years ago to provide every man who wanted it access to mass amounts of information through individual computer terminals.

"And things will be worse by the year 2000," Salton predicted.

The Cornell Library has 4.5 million items with no way to identify and remove them or to restructure their priority, he said.

"We have computer systems that handle individual responses from individual libraries that, piecemeal, keep track of borrowers. We have systems that make acquisition easier.

"What we need is enormous files plus real time control," he said, "and that can't be done yet in the library."

Pointing to success in limited areas, Salton described cooperative or networking ventures in which libraries join forces and acquire only part of what they need, borrowing the rest from the other members.

But this defeats the principle value of the library which is based on "the number of materials stored, not merely accessible," he said.

# Awareness, Quantification Seen Ways for Improving Business DP

By Don Leavitt
Of the CW Staff

SAN DIEGO – Commercial installations need better means of developing reference points for many of their activities, speakers at an ACM session on methods for business DP agreed.

The means may stretch, as the presentations showed, from awareness of the constraints of data base management systems (DBMS) to development of ways of identifying – and quantifying – factors that can impact the installation's operations.

Since DBMS comes between the user and the stored data, it impacts the way the data is stored, how the application programs function and how the end user interacts, IBM Fellow Mary E. Snuggs said. No current implementations meet all the objectives of transparent data management, and the degree to which they fail determines the degree to which trade-offs of objectives and resources must be considered, she added.

The limits of software capabilities are secondary to the user vision of what would be significant events in the life of a company or department, according to John Dolan of Weyerhaeuser Co., who described a computer-based conferencing technique to define objectively and quantitatively just such a vision.

The so-called Delphi method of conferencing was modified somewhat by Weyerhaeuser to run its impact analysis, Dolan said. After managers defined general factors that might affect their specific operations, a questionnaire was prepared, in matrix form, to help managers pinpoint the monetary value involved if one of these events actually took place.

Managers answered the questionnaire anonymously through entries on local terminals.

At the central computer installation, the coordinator summarized the results and sent back to each manager his own responses and the range of all responses.

Respondents were then allowed to change their ratings, with a consensus the hoped-for but not necessarily the achievable goal.

Project managers went through a computation process, multiplying the scaled monetary value for each event by a factor representing the likelihood of its happening.

The result, Dolan pointed out, was a rank order list, with comparative values shown, of the events and their impact potential.

In her presentation, Snuggs outlined the anticipated advantages of using DBMS and pointed out that each apparent advantage tended to be a restraint in fact. She admitted "at present it is not known how best to meet all of these objectives concurrently."

A DBMS should have built-in capabilities to meet the objectives of data independence, relatability, compatibility, structural adaptability, integrity, recoverability and security, she said.

# Software Physics Buffs Agree Only on Future Utility

By Edith Holmes
Of the CW Staff

SAN DIEGO – Software physics should only be pursued if it can be applied to the present needs of computer users, a panelist told an ACM '74 audience during a session on the controversial subject here last week.

Defining software physics as "an attempt to extend natural physics to meet the requirements of computer measurement," Kenneth Kolence, a consultant in Palo Alto, Calif., said the new discipline must correspond exactly to the laws of natural physics if it is to have any validity.

But while they acknowledged that, ultimately, software physics should find some practical application, panelists sharing the podium with Kolence tended to support the concept only as an initial building block in devising "a science of computing." Similarly, they contended, software physics exhibits properties related to but not the same as those of natural physics.

Insisting that software physics be developed "to solve real and important problems," Kolence defined the domain of the subject as "measurements of system variables resulting from the action of software on a configuration or subconfiguration."

Within this framework, software energy and work are equivalent to energy and work in natural physics; configurations and subconfigurations are comparable to physical systems, and system workloads become forces, he said.

"The processor does one unit of work on a storage medium when the device causes one byte (or one bit) of that medium to be altered," he explained. By plotting energy or work against time and software existence potential and realization, Kolence acquired the power, storage capacity and energy density parameters needed to define his theory of software physics.

He further defined three areas requiring the initial attention of software physicists. "We must establish a fundamental definition of configuration capacity; we need to define how to measure the capacity usage of an arbitrary workload or workload component; and we should devise a means of calculating the capacity available relative to some workload," he said.

While he, too, sees software physics as a means to understanding the relationship between software systems and the machine resources they require, John E. Savage of Brown University disagreed that the discipline has progressed to the point of sound general theory and notation. "We have yet to determine whether laws exist which govern considerations like storage-time trade-offs," he commented.

Savage defined the software physics problem as: "Given particular values for space and time, how can we calculate the work a system can do?" He suggested that any work a system does is a function of its complexity. Accordingly, his theories center on measuring that variable.

Based on his venture into software physics thus far, Savage said his calculations indicate "that storage can be traded for time in a system, and vice versa, and that multiprogramming and multiprocessing encourage efficient computing.

Concurring with Savage, Leo Hellerman of IBM Germany argued it is too early to say which of the approaches to measuring data processing systems will be best. "We need more experience to see how useful each of these theories is in practice," he said.

He viewed the theoretical task of software physics as finding that implementation of an arbitrary process that requires the least amount of work. "Then we must learn to compute the work of the primitives of some high-level language, like APL, so a user can be told how much work his program actually did," Hellerman continued.

Stuart H. Zweben of Ohio State University looked specifically at the variables Hellerman mentioned. His theory of software physics dealt with measures of program size, or volume, and the level of language used.

Zweben said his approach leads to observations such as "the bigger the program, the lower the level of language," and to ratios, like volume/level of language, which give the user some measure of the effort required to write a program.

And with due regard to the practicality of software physics, he indicated this particular ratio has been demonstrated to be useful in deciding what characterizes "good" modularization in program writing.

Despite the differences in their definitions of software physics, all of the panelists agreed that a closer relationship exists between the computer sciences and the physical sciences than they initially acknowledged.

CW at ACM

# GAO Study Blasts Poor Documentation

*(Continued from Page 1)*

becomes difficult; new programmers can't work on programs developed by someone else; program sharing potential drops; and rather than modifying existing systems, whole programs often must be rewritten.

Good documentation, the report said, should communicate the following information about a system:

- Purpose of each program and how to run it.
- Format and flow of data through the computer system.
- Logic of the operations performed by the computer.
- Controls included to insure the validity and integrity of the data being processed and the results.
- Limitations and assumptions incorporated in the operation or program.

The first problem to be faced, GAO said, in instituting good documentation is setting standards.

The second is establishing review functions to assure that work necessary for good documentation is performed.

The report recommended that standards now being developed by a National Bureau of Standards task force be adopted throughout the government.

The report, entitled "Improvement Needed in Documenting Computer Systems (B-115369), is available for $1 per copy from Reports Distribution Section, U.S. General Accounting Office, Washington, D.C. 20548.

# Panelists View CPE Objectives As Extension of Company Goals

By Edith Holmes
Of the CW Staff

SAN DIEGO – Users must study the performance of their computer systems in terms of objectives defined by the overall goals of their organizations – and not necessarily in terms of some set of specific standards, panelists told an ACM session on "user experience with computer performance evaluation" (CPE).

Consultants Louis Desiderio, Dennis Salosky and Sal Catania from Coopers and Lybrand called this the common denominator that should be used for any attempts at CPE, whether run by a user's own staff or by outside consultants.

"While day-to-day evaluation is essential, it isn't necessary that these studies be comparable to the approach taken by consultants to improve hardware performance," Catania said.

"Neither hardware nor software monitoring is appropriate in this kind of evaluation, because these measures don't include the daily influences people have on the system."

In addition, Catania indicated the typical consultant's approach generates far too much detail to be collated and reviewed by the manager of a DP center on a daily basis.

"He simply doesn't have time to look at 24 hours of CPU, disk and tape utilization data every day," the consultant noted.

Objectives must be broad enough to relate to company goals, yet specific enough to allow for their measurement at the DP site, he said.

With little time in which to assess their function, DP managers might concentrate on such general, yet specifically measurable, parameters as the availability of the system to in-house users and the turnaround time normally required by the computer.

Similarly, the consultant's aim in performing a system evaluation for a client is to help DP management make informed hardware acquisition, configuration and project scheduling decisions, based on the demands placed on the DP function by corporate needs, Salosky commented.

Working with a client in the health care field, Salosky recalled Coopers and Lybrand was asked to help the institution maximize the overlap of its utilization of resources before its operation was expanded to include some 70 terminals.

Specifically, the consulting firm was contracted to determine the reserve capacity of the IBM 370/158 and 145 systems used by the institution, to identify any imbalances in these configurations that might affect performance and to investigate a new teleprocessing system to determine the causes of its unacceptable response time, according to Salosky.

Using hardware monitors and accounting data, the consulting firm determined the institution's DP center should balance the system activity of the 145 by moving three data sets and nine packs off the CPU, "tune" the configuration of its system by making some of the transient OS routines core-resident and use the cylinder overflow option on the collection file of its teleprocessing system.

These and several other recommended changes helped put the DP center at the institution in a better position to evaluate its readiness to implement the institutional goal of expanding the system to include on-line terminals in 70 areas.

CW at ACM

## The Measurement 'Fad'

By Edward J. Bride
Of the CW Staff

SAN DIEGO – The current emphasis on computer performance measurement has almost become a "fad," and some users may be wasting money on too much of a good thing, according to Cmdr. Jan Prokop, head of the Navy's ADP Equipment Selection Office.

There is a "lot of pontificating" on performance measurement today, he said, while measurement "is the type of thing that people with good sense have been doing for some time."

Yet it is bad to "measure enthusiastically" in that system overhead and actual dollar expenditures can bring a waste factor into any reported savings, he noted at an ACM session here.

The economic factors sometimes reported by users as tremendous savings are often exaggerated, he continued, especially with some government reports.

Sometimes people costs are not included in the cost of measurement, he noted, despite the fact that hardware monitor operators are additional personnel required for the measurement effort.

He also noted that some savings are really "cost avoidances" and it is often difficult to spend that money other than where originally approved.

System degradation, common with software monitors, is another factor that is often ignored when users report savings due to performance measurement, he continued.

As an aside on the economic factor, Prokop commented that measurement is done because of the high cost of machines, and yet most shops spend more money on people than on hardware.

He also called on managers to set specific goals against which their systems could be measured. If there are no specific goals, such as response time improvement, then people are "wasting money" on monitors, he added.

People today are fascinated with nanoseconds and CPU time, yet "we argue over whether 90% CPU usage is too high or too low," he said.

Another speaker in the sparsely attended session noted the importance of goals especially during any kind of conversion. Dean Fitzbag of Electronic Data Systems commented that things normally are run "sloppily" during a conversion, and specific goals help management keep conversion and the existing operation in line.

*Increase DP Effectiveness*

# Formal Programming Can Simplify User Interface

By Don Leavitt
Of the CW Staff

SAN DIEGO – A need exists to simplify the interface between the user and the computer in order to increase the effectiveness of data processing.

This need can be satisfied in many ways, among them the development of formalisms in the programming process, according to ACM SigBDP chairman Bruce Wrigley of Travelers' data center, who was also chairman of an ACM session on language developments for the user.

Covering an early portion of a programming project life cycle, Dr. David M. Sherr of Temple University proposed a "nonprocedural programming language for structured systems development."

Sherr shied away from the term "automatic programming" in connection with his project, noting "even assemblers were considered 'automatic programming' tools when they first appeared."

Instead, he stressed that the user, the designer and the implementor (or programmer) all have assigned roles in the use of his information system (IS) specification standards.

IS specification standards define what pieces are needed for the desired information systems, include descriptive "and prescriptive" elements for the combination of the pieces and collect the pieces of the IS design to form program specifications at a functional level and to specify program algorithms, he explained.

Some such conceptual scheme is needed, Sherr said, as the start of the process that may culminate in the use of structured programming techniques. Structuring of programs begins with "downward refining" of just such nonprocedural specifications until, at the final, lowest level, each statement about the program is in fact a primitive in the implementing programming language.

### Differing Expectations

Each person involved with a developing system has different expectations depending on his or her role, and the nature of the problem as perceived from these perspectives is what accounts for many communications problems, Sherr thought.

The user defines the IS refinements clearly enough in his view, Sherr explained, but in reality he is just stating the corresponding communications system of the organization that wants to use the IS under development.

The designer explicitly describes the IS modules he intends to have developed and prescribes the construction of those modules to preserve the integrity of the solution as he sees it.

The implementor constructs the IS reliably and accurately in accordance with his understanding of the designer's requirements in order to deliver the system to the user.

The likelihood that these three views will become more and more diverse as they mature means, Sherr emphasized, that a capture of the description of the system in an automated way is vital to the success of the project. This capture process must start, he added, with the storing of the user table of organization, the roles the people involved play and the flow of work through the structure.

### Disarming Modesty

If Sherr himself had had such an understanding of who should check various aspects of a project, he added by way of illustration, he would never have gone through the agony of converting a Burroughs-based Cobol banking system, developed in Pennsylvania, to run on IBM 360/370 gear in California.

With a disarming lack of modesty, Sherr said he was able to handle the technical aspects of recoding ("at considerably higher costs of time and money than originally expected") but was stopped cold when the client's legal staff said the system couldn't be used as planned.

California banking laws simply would not permit the concept of branch office control that was inherent in the original design of the system, whereas Pennsylvania law found it acceptable.

Sherr admitted that much of what he proposed had been put forth by others earlier, but only as separate fragments of the scheme he had put together as a conscious synthesis of what had gone before.

As unrefined as it might be, the IS specifications standards approach might serve, he hoped, as a first step toward a formal definition of computer programming.

## Assembly Language: Popular but 'Inefficient'

By Nancy French
Of the CW Staff

SAN DIEGO – "We don't code in octal any more, so why use Assembly language?" David Dahm, a consultant, asked an audience of ACM members here.

One of the ideas posed in a session devoted to the "unpopular and unacceptable" in the world of computing, he said it makes sense not to use Assembler because "higher level languages are far superior, easier to use and more efficient.

"People don't want to give up Assembler because they understand it so well," he explained, but nevertheless, "Assembly language is obsolete and has been for 10 years.

"If your compiler can't handle coding in a higher level language, change your compiler," he shot back in response to an objection raised by an attendee who said he needed the tight step-by-step control provided by Assembler.

Dahm's view was supported by Forrest Carhart, manager, programming languages and applications, Burroughs Corp., who admonished attendees to eliminate machine-dependent languages for their operations.

"We're working toward eliminating all references that hint of hardware architecture," he said.

"At burroughs we can do this, because the people who design the systems do the programming," he explained.

"The point is," Dahm said, "given two different programmers, writing the same program, sometimes you are more efficient in Assembly language and sometimes in a higher level language."

Citing experiments he performed, higher level languages were at least 10% more efficent than Assembler, no matter what the applicaton," he said.

Carhart urged attendees to "get more professional. We'll never become professional as long as we use Assembler. What we need is integrity and discipline in programming.

"Users should be revolting against using Assembler to achieve maximum efficiency. I think we're on a nostalgia trip," he said.

Session chairman David Bulman, U.S. Customs Service, regaled the audience with his personal list of other "unpopular" and "unacceptable" ideas:

- No programming team should ever exceed five.
- There doesn't exist a systems analyst who can't or doesn't code well.
- First-level management must read and understand all code written in their group.
- Machines without word structures.
- Interpretive hardware.
- Associative memories.
- Codasyl proposals should be accepted as the standard.
- Lisp.
- Computers are for users.
- Upper- and lower-case printers.

# Keeping up is what it's all about in today's swift-moving computer world...the smart, economical way is through

# The Library of Computer and Information Sciences

## Take any 3 books for only $1 each

**(values to $60.95)**

if you will join now and agree to buy only 3 more books—at member discount prices—in the next 12 months!


(retail prices shown)

**56370. INTRODUCTION TO PROGRAMMING LANGUAGES.** *Harry Katzan Jr.* A leading authority on computer programming. Professor Katzan presents a clear and comprehensive introduction to today's three most widely used languages BASIC, COBOL, and FORTRAN. Cleverly organized so that languages form a logical continuum **$13.75**

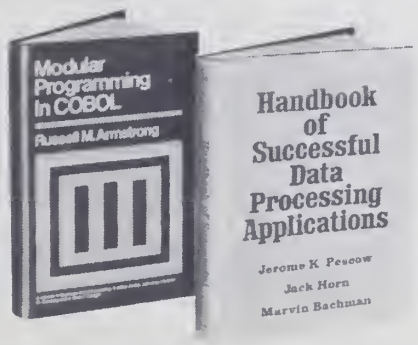
**81920. SYSTEMS ANALYSIS FOR DATA TRANSMISSION.** *James Martin.* The latest and best by the dean of writers on computer telecommunications and teleprocessing. Comprehensive and timely, this large volume shows how organization networks can slice data transmission costs in half by careful choice of design alternatives **$22.50**

**52250. HANDBOOK OF SUCCESSFUL DATA PROCESSING APPLICATIONS.** *Jerome K. Pescow, Jack Horn, and Marvin Bachman.* Three veteran consultants provide practical advice on how to save time and dollars by obtaining the maximum value from a computer. A great opportunity to get really professional knowhow without spending a small fortune in consultants' fees. *Counts as 2 of your 3 books.* **$24.95**

**69401. PL/I PROGRAMMING.** *Joan K. Hughes.* PL/I has synthesized almost all that has been known about languages useful for solving numerical scientific and business data processing problems or combinations of them. There is no better introduction to this unique programming language. **$12.95**

**49371. FUNCTIONAL ANALYSIS OF INFORMATION NETWORKS/FUNCTIONAL ANALYSIS OF INFORMATION PROCESSING.** *Programmers, system analysts, system designers, and data processing managers now have available a set of books they can turn to for much-needed information on the functions involved in network and information processing. The set counts as 2 of your 3 books.* **$28.90**

**40061. COMPUTER SECURITY MANAGEMENT.** *Dennis Van Tassel.* Must" reading for all computer professionals. Pinpoints the responsibilities of computer center employees and details the how-to's of security implementation. **$10.50**




**52200. HANDBOOK OF COMPUTER MAINTENANCE AND TROUBLESHOOTING.** *By Joel W. Maguire.* Clearly examines preventive maintenance inspection problems of breakdown detections and repairs for today's modern computers. This 366 page handbook provides step-by-step procedures of typical routines with several hundred diagrams and charts. **$18.00**

Looking ahead to tomorrow's developments is standard in the computer field—and yesterday's techniques aren't about to make it. With competition getting tougher, it's even more important to keep abreast. That's why **The Library of Computer and Information Sciences** can be mighty important to you—it's a time-saver and a money-saver, too. Why not check into it now?

**41690. DATA PROCESSING ORGANIZATION AND MANPOWER PLANNING.** *Dick H. Brandon.* As president of an international management and technical consulting firm Brandon spent two years devising techniques for manpower utilization and organizational development for use in data processing consultation. Now he has revealed in detail, the principles his firm so successfully used **$14.95**

**42271. DIGITAL SYSTEMS: HARDWARE ORGANIZATION AND DESIGN.** *Frederick J. Hill and Gerald R. Peterson.* A refreshingly different analytical approach to computer organization and digital system design that will certainly become a classic in its field. Covers hardware, software, microprogramming, intersystem communications and much, much more **$17.95**

**55331. INFORMATION SYSTEMS.** *John G. Burch, Jr. and Felix R. Strater Jr.* Ingeniously welding together a wide range of material this original volume provides all the necessary technological, organizational, and systems background needed to successfully develop information systems for just about any organization. **$12.95**

**81880. SYSTEM ANALYSIS TECHNIQUES.** *Edited by J. Daniel Couger and Robert W. Knapp.* Consisting of 25 carefully selected papers by the leaders in the field, this highly practical volume tells how to properly evaluate an existing system, determine managerial information requirements, and assess the benefits of computerization of a management system **$14.95**

**79230. SOFTWARE SELECTION.** *Susan Wooldridge.* Switching to pre-packaged software could save you time and money. This exceptionally well-written volume spells out everything you need to know to make wise software selections **$9.95**

**41620. DATA BASE MANAGEMENT.** *William C. House.* A well-rounded selection of 35 papers by leaders in the field thoroughly examining each of the major functions performed by data base systems. A practical user-oriented wide-ranging volume lucidly surveying every important aspect of data processing management **$19.95**


**78335. SIMULATION USING GPSS.** *Thomas J. Schriber.* The first thorough explanation of GPSS and its uses. Includes 27 GPSS case studies and over 300 problems which serve to clarify the step-by-step analysis of all the details of the GPSS language **$16.95**

**HOW THE CLUB OPERATES**

• The Book Club **News,** describing the coming Main Selection and Alternate Selections, will be sent to you 15 times a year at three to four week intervals. • If you wish to purchase the Main Selection do nothing and it will be shipped to you automatically. • If you prefer one of the Alternates, or no book at all, simply indicate your decision on the reply form always enclosed with the **News** and mail it so we receive it by the date specified. • The **News** is mailed in time to allow you at least 10 days to decide if you want the coming Main Selection. If because of late mail delivery of the **News,** you should ever receive a Main Selection without having had the 10-day consideration period, that Selection may be returned at Club expense. • After completing your trial membership, you will be entitled to take advantage of our fabulous bonus plan. (Offer good in Continental U.S. and Canada only. Prices slightly higher in Canada.)

**83760. THEORY OF COMPUTATION.** *Walter S. Brainerd and Lawrence H. Landweber.* Fascinating new volume offers a totally new presentation of the theory of computation in a mathematically rigorous fashion. An important book. *Counts as 2 of your 3 books.* **$19.95**

**39850. COMPUTER INPUT DESIGN.** *By Susan Wooldridge.* Investigates the variety of today's input options that offer greater accuracy, speed, and security than traditional punched cards or paper tape. Covers costs, advantages and disadvantages of input handling equipment and how to put together a system that best utilizes the computer and provides the best service **$10.95**

**33430. THE ANALYSIS OF INFORMATION SYSTEMS. Revised Edition.** *Charles T. Meadow.* This updated edition by a distinguished computer authority offers an all inclusive treatment of the four aspects of information processing and retrieval **$14.95**

**42261. DIGITAL COMPUTING AND NUMERICAL METHODS.** *Brice Carnahan and James O. Wilkes.* The authors best remembered for the highly popular *Applied Numerical Methods*, here offer a brilliant presentation of numerical methods with practical application to their implementation on digital computers **$13.95**

**55410. INFORMATION TECHNOLOGY. The Human Uses of Computers.** *Harry Katzan, Jr.* Unusual comprehensive synthesis of computer sciences from how computers work through how they are programmed to the future of cybernetics. A broad-scope important book **$11.95**

**76910. THE SCIENTIFIC PROCESS AND THE COMPUTER.** *Donald L. Streeter.* 468 pages profusely illustrated. Describes in detail the entire range of computer based systems and services currently available in support of industry, technology and government plus a methodology for planning and managing computer services **$18.50**

**60040. MANAGEMENT OF SYSTEM ENGINEERING.** *Wilton P. Chase.* Covers the dynamic process by which a system is designed and explains the steps essential to identifying and developing a total system **$14.95**

**56190. INTRODUCTION TO ARTIFICIAL INTELLIGENCE.** *Philip C. Jackson Jr.* A history of the fantastic strides in the science of making machines smarter with some careful predictions, a sharp look at the principles and broad coverage of related fields **$17.50**

**The Library of Computer and Information Sciences** 7 49B
Riverside, New Jersey 08075

Please accept my application for membership and send me the three volumes indicated, billing me only $1.00 each. I agree to purchase at least three additional Selections or Alternates during the first year I am a member, under the club plan described in this ad. Savings range up to 30% and occasionally even more. My membership is cancelable anytime after I buy these three books. A shipping and handling charge is added to all shipments. **Send no money. Members are billed when books arrive.**

**3 books for $1.00 each**

**Indicate by number the 3 books you want.**

| | | |
|---|---|---|
| | | |

*Some expensive books count as 2 or 3 selections.*

Name _____

Address _____

City _____ State _____ Zip _____

Book selections purchased for professional purposes may be a tax-deductible expense

## IMS User Claims

# Generalization Heightens Problem of Tuning DBMS

By Don Leavitt
Of the CW Staff

SAN DIEGO – Even though users of data base management systems (DBMS) were "irritated by the inefficiencies of the early implementations," there has been even more concern lately in improving the performance of the systems, Prof. Ben Shneiderman of Indiana University told an overflow session at ACM '74.

The problem of tuning, however, is not limited to any one system or set of systems, but arises naturally from the process of generalization itself," Hugh Hoskins of Rockwell International said later in describing his company's efforts to tune IBM's IMS.

A generalized system is bound to be somewhat less effective for any individual user than would be a specialized solution, he said, and IMS copes with the problems in four ways: It limits the scope of the solution, imposes a discipline on the user, includes self-correcting and self-adapting mechanisms and provides for human-tunable variables.

### Big Is Best

IMS is a highly flexible system aimed at a broad spectrum of the DBMS marketplace. It runs best, Hoskins said, in a medium to large OS shop – "the larger the better" – where the objective is to put a large portion of the enterprise on-line.

As with most generalized DBMS, IMS trades application development costs for processing efficiency, and as a result it requires "a powerful CPU with lots of memory and scads of direct access storage" to achieve acceptable performance, he said.

Literally dozens of tuning variables exist in IMS, Hoskins noted, "and the degree to which these are optimized can make or break an IMS installation." The variables fall into two broad areas: data base administration and IMS system definition.

The data base administrator must make data base and application design decisions that trade off storage efficiency versus processing efficiency, user application performance versus total system performance and ease of implementation versus ease of maintenance versus throughput.

"There are those application designers in any organization," he said with a chuckle," who feel that the amount of system resources they can dominate is an extension of their masculinity."

The IMS system definition specialist must make decisions closely akin to those of the data base administrator. Proper load balancing of packs, arms, control units and channels, as well as selection of optimium memory dynamics pools, are all part of his responsibility.

Proper placement of queues, indexes and system libraries, determination of which system components should be core-resident and which should be on high-speed drums or disks, and finding ways to minimize directory searching and module loading are still other aspects of the system definition that can affect performance, Hoskins said.

### Necessary Resources

In order to accomplish a successful tuning program, an IMS installation requires the following resources, he continued: proper organization with defined responsibility, authority and management backing, IMS, quantitative analysis and system programming skills; and good records and documentation.

Other resources required are "a functioning change control system" and software and hardware tools for measuring the impact of tuning efforts on system performance.

The result of a successful tuning program could be reductions in hardware costs, better throughput, better planning and control or change and good user relations, "something a number of IMS shops do not have," he said.

Tools from IBM to support tuning efforts "could not have been designed more poorly if they had been designed to be no help at all," Hoskins added in answer to a question from the floor. He noted that the data communications monitor used became an integral part of the system nucleus and included no real data reduction software.

"The report put out by this monitor is just about as long as a printout of the entire log tape for the period being monitored. And that's not much help. I want something that will let me scan a reasonable sized report and say everything's OK or there's the problem."

CW at ACM

# Proposal to Reduce Math Requirement In Curriculum '68 Meets Opposition

SAN DIEGO – The idea that some computer science majors are taking more math courses than they need, based on ACM's Curriculum '68, was sharply disputed at an ACM '74 meeting here last week.

The session featured a report of the Curriculum Committee, which recommended modifying the "core" or minimum requirements in mathematics prescribed by Curriculum '68. The move would ease the burden on students whose interest lay in business data processing rather than earning degrees in the more esoteric applications of computer science, panelists said.

Among the panel's suggestions were reducing basic math requirements to "some" set theory, elementary linear algebra, a "little" calculus and probability and statistics.

According to Donald Loveland of Duke University, subject areas such as discrete structure could be "blended into other computer science courses" rather than studying them for a whole semester.

"Linear algebra, the elements of matrix theory and probability and statistics," deemed necessary by Curriculum '68 are "not even pressed by the big name computer science schools," Loveland explained.

### Critics Converge

Those who disagreed with Loveland's view didn't hesitate to speak out, however.

"In a field that is changing as fast as computer science, how can we equip a student to do well at his first job with no thought to the job he'll face 10 years from now?" one listener asked.

Another said, "What do you do with the student who has taken the minimum requirements who then decided to continue studying his master's degree in computer science?"

Still another warned, "We have to be careful with minimums. People may grab onto them and be misled into believing that's really all they need."

In defending the committee's position, Loveland pointed out that the recommendations concerned only the "core" requirements, not a recommended program. "I'll still continue to recommend many more courses for my own students," he said.

Lending some perspective to the committee's recommendations, Gerald Engel of the Virginia Institute of Marine Science, suggested that the flaws were not necessarily in Curriculum '68 but rather in how it was implemented in many places.

Although the major dispute concerned mathematics requirements, attendees recommended other modifications such as increasing student exposure to hardware architecture, as well as emphasizing the growing interface between and "interchangeability" of hardware and software solutions.

With regard to the difficulties experienced by community college students matriculating to four-year computer science programs, one listener suggested that rather than reducing the number of math courses, schools "rearrange" where they fall in the curriculum so transfer students don't lose a lot of time making up these requirements.

The changes in math requirments were the only recommendations the Curriculum Committee made following its July meeting in which Curriculum '68 was studied in its entirety.

### Matching Money

STANFORD, Calif. – Computerized matchmaking has advanced from the dating game to the field of academics at Stanford University. Here, a computer system has the task of matching research interests with funding sources.

The Stanford Computerized Researchers Information Profile Technique (Script) has two purposes: it constantly informs faculty of new funding opportunities in areas where they have an interest and informs potential research sponsors of individuals who are interested in a certain field.

# Design-Phase Testing Could Improve Program Quality

By Don Leavitt
Of the CW Staff

SAN DIEGO – Despite a trend toward standardized, problem-oriented and structured programming languages, Barry De Roze, program quality director for Vitrolabs, told an ACM '74 session on testing business systems he saw "no cause for great optimism" for application programs in the immediate future.

To change that situation, he said, users must develop and stick with a scheme of verification and validation of software which, as its major feature, includes testing considerations in the earliest parts of the design phase.

User programs should probably also include built-in testing aids, he added.

An independent testing team is almost an absolute prerequisite for such an approach, DeRoze noted, and this team should check out both the executive and application areas of any system being tested.

### Traditional Versus 'Global'

There are two distinct schools of thought on testing, DeRoze said. The traditional approach allows unconstrained development processes and then applies extensive verification validity testing to assess the quality of the output. It tries to test many logic paths and to establish good confidence levels, "but it has no built-in feedback to the design phase."

The "global" approach, by contrast, imposes a rather specific structure all through the design and development cycle, to encourage the generation of high-quality code from the beginning. As the system moves along, the tester – "true, it's not testing in the conventional sense" – concentrates on areas of the specifications or coding that appear to have the best potential for improvement.

The global approach works from a position of anticipation rather than reaction to problems. No matter how well-tested a system is, residual errors still exist in the coding, he explained, but the smart programmer will have some idea of what may go wrong and how serious it can be before it happens.

In the global approach, the testing process actually encompasses three separate if overlapping areas, he said.

"Verification" deals with actual computer code and covers conventional debugging methodology.

"Qualification" assumes successful completion of the verification phase and attempts to answer the question, "Does the code and the system design adequately solve the pertinent problem?" Finally, "certification" is the pseudo-legal phase that might otherwise be called acceptance testing, before the system becomes operational, he said.

Because they deal with both coding and design specifications, though from somewhat different viewpoints, qualification and certification are sometimes grouped under the single term "validity," DeRoze explained. Even though forcing the programmer or analyst to consider the test environment early in the design of a system – "instead of being a catch as catch can operation after everyone's all through with it" – may make him seem less productive, it should in fact eliminate many problems that perhaps couldn't be adequately handled, he added.

Conventional verification procedures apply to any language, essentially to see that the code assembles or compiles correctly, that the processor assigns legal addresses and that the object program executes "trivial" test cases as expected. While it insures that the code is self-consistent, it does not insure that it is correct, DeRoze stressed.

If done correctly, qualification should demonstrate the subject program's conformance with its operations requirements. It should also identify and evaluate potential failure points and the effect of any failure that might occur at those points.

## CW at ACM

### Top-Down Programming

Responding to a question of how to anticipate the "disasters" that sometimes occur when "good" modules are brought together at integration test time, both DeRoze and fellow panelist Jerry L. Ogdin of Software Techniques, Inc. spoke out strongly for top-down programming.

Ogdin agreed also that "much more effort is needed at the front end," including an honest evaluation of whether the user specification as given can be implemented. "There's no use trying to force them if they just won't go."

Once the specifications are set, "top-down design and programming can be done, though it is tough to get programmers to change their habits," he said. Outside pressure to do things a new way may be abrasive, but good results can be obtained if a competitive spirit is built up between the programmers and the test team, Ogdin added.

The question of end-user participation in the development cycle received nearly unanimous answers from the panel. The user should be welcomed during specification development and for the evaluation of the final test results. But no one wanted the user "under foot" when intermediate tests "with obviously poor results likely" were being studied.

## Bus Schedules Go Awry in N.J.

WALL, N.J. – Outdated information from the township and bugs in the state's computer program combined to wreak havoc with busing schedules here when schools reopened in September.

The result: computer-designated bus stops too far from home, in some instances a distance of a mile or more; several students who reside less than a mile from school were assigned stops located a mile or two in the opposite direction; students were advised to await buses 2,000 and 3,500 feet from railroad tracks which no longer exist; and kindergarteners scheduled for afternoon classes received morning bus routes, a spokesman for the township's Board of Education commented.

Approximately 3,600 bus passes, stipulating the time and location of pickups, were prepared for students by the state Division of Pupil Services Transportation Information Planning Services (Trips) program.

With up-to-date information, the right controls and a full-time data processor acquired just three-months ago, the township should be able to purify the input, he remarked.

## But Doctors Have Reservations

# 'Patient Power' Increases With Diagnostic Systems

By Edith Holmes
Of the CW Staff

BOSTON — Without ignoring the issues of privacy and confidentiality, several physicians speaking at a recent conference here indicated they see the computer as a medium for getting "patient power" into the diagnostic and therapeutic process.

By using an interactive system to interview people to obtain their medical histories, Warner Slack, a physician and associate professor of medicine at a local hospital, told the Conference on the Legal Aspects of Computer Use in Medicine his patients feel they are in charge during the interview.

"Patients generally prefer the computer to a doctor as an interviewer because, for the first time, they are in control. Within the framework of the questions, patients can dictate the course of the interview," Slack said.

The computer can be programmed both to enable the system to explain a question to a patient if he or she doesn't understand it and to provide a "none of your damn business" or "skip it" option should a patient wish to keep some particular information private, he added.

Slack noted that by using a computer physicians could more easily allow their patients full editing privileges in regard to their charts.

While medical interviewing by computer would save physicians time and money and help to standardize the legibility, completeness and retrieval of records, Slack indicated potential legal problems are involved. For example, who would be responsible if the computer program asked a question incorrectly or omitted an important piece of information? he asked.

CW Photo by E. Holmes

Warner Slack

"Most projects in medical interviewing are still in the research stage, and we have no quantitative evidence as yet to prove the computer as interviewer is helpful to a patient," Slack remarked.

Similarly, Dr. Howard L. Bleich, associate in medicine at a Boston hospital and associate professor of medicine at Harvard Medical School, indicated more evaluation will be needed before it is possible to determine whether the computer is an effective diagnostic assistant.

In use for only a few years, computer programs designed to help physicians make disgnostic decisions are apparently less successful than billing applications in doctors' offices, Bleich said.

He recognized, however, an increasing need to develop diagnostic systems "as the constant need to keep up conflicts more and more with the needs of patients."

An associate professor of surgery and a computer engineer at the University of Alabama, Dr. Louis C. Shepard, uses a computer system to monitor and direct the infusion of blood to patients in the eight-bed cardiac intensive care unit at the university's medical center.

Like Slack, Shepard contended his system has had a definite impact on patient care but conceded he can't show this effect quantitatively.

But when his IBM 1800 wasn't in use for a short period of time, he noted, an Arthur D. Little Co. study showed the time nurses spent taking measurements tripled, the time spent charting this information doubled, one-third as much time was spent interpreting these measurements and patients received only one-third as much attention.

Based on this study, Slack estimated that without the computer system the unit would require twice as many beds and three times as many nurses.

### Some Questions

While he conceded medical computers hold the potential for improving health care delivery, G. Otto Barnett, M.D., director of the laboratory of computer sciences and associate physician at a Boston hospital and associate professor of medicine at Harvard Medical School, noted a number of problems have been encountered in present medical applications of computers. He posed a variety of questions, including:

- How can information generated by a computer be authenticated when that system can't accept the classical means of authorizing a document, the signature?
- What standards of comparison are available for evaluating the performance of a computer system?
- What standards should define the availability of information and how long can information be retained on-line?
- How accurately does the precise chronology of medical events have to be recorded by the computer when a variety of medical personnel have access and are adding information to patient files?

"I have no sympathy for those in medicine or law or DP who think these machines can do everything," Barnett said. "Choices must be made in order to stike a balance between the availability, the accuracy and the confidentiality of information, given the requirement of being cost-effective."

# Few Legal Handicaps Seen in Health Care Systems

By Edith Holmes
Of the CW Staff

BOSTON – No significant or insurmountable legal handicaps or barriers exist in the use of computer systems for medically acceptable applications, an attorney told a national conference on the legal aspects of computer use in health care delivery here recently.

But legal factors should be considered, along with technical and medical elements, when designing and implementing automated systems, Roy N. Freed, author and lecturer on the legal aspects of computer use at Boston Unversity Law School, cautioned the audience of 80 physicians, hospital administrators, lawyers and data processors.

Jointly sponsored by the American Society of Law and Medicine, Inc. and Blue Shield of Massachusetts, Inc., the conference went beyond the familiar legal problems of privacy and confidentiality to treat contracting for computer systems, the liability involved in creating and using computerized health-care systems and the duty of physicians and hospitals to use automation to improve health care delivery.

Freed noted that while the actual impacts of most rules of law depend largely on the circumstances involved in particular cases, some existing rules could actually require the adoption of computerized health-care systems. "Legal rules adopted in the future might also require the use of such systems," he added.

Given the availability, economy and proven performance of systems and software, Freed predicted many automated diagnostic systems will become elements of "due care." Computerized monitoring of patients and closed-loop systems used in therapeutic procedures will eventually be required, he said.

Freed further suggested "computerized medical records will be used increasingly as sources of information for review and other supervisory functions."

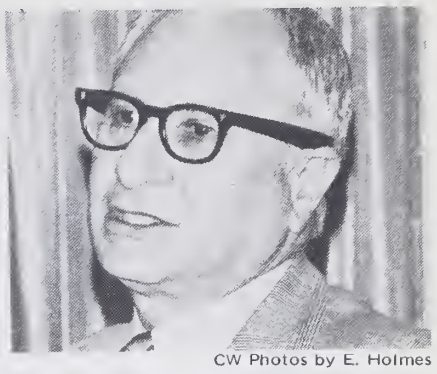
### Product Liability

But while physicians and hospitals may become obligated by law to use computer systems in a variety of applications to meet certain, established standards of care, the professional and tort liability exposure of physicians and of hospitals, respectively, could be reduced, according to Freed. He also anticipated an increased product liability on the part of suppliers of computer systems and software programs for health care delivery.

"As in many other areas, suppliers of computer systems and software programs might be particular legal targets" due to changing liability measurements and exposures, he remarked.

Particularly with regard to liability, however, "many legal rules are frustratingly general and difficult to apply with any degree of certainty," Freed commented. "Little, if any, resolution of relevant legal questions involved in health care delivery systems has been experienced."

He pointed to contracts for the acquisition of computer systems and programs as still another area where legal questions abound. "Considerable innovation will be required in characterizing the transactions and properties involved here," he said. Properly constructed contracts could "anticipate adverse legal impacts and forestall them."



CW Photos by E. Holmes

Roy Freed

Because computer technology "is extremely dynamic," Freed stressed that the assessment of legal considerations "must be continuous."

He called on various professionals "to recognize their respective interrelated roles and to work together."

## National Insurance To Be Supreme 'Test' Of DP Privacy Issue

BOSTON – National Health insurance will be the "biggest test" of the "computer privacy" issue in medicine to date, a computer industry official warned a recent meeting of physicians, lawyers and DP personnel here.

Speaking before the Conference on the Legal Aspects of Computer Use in Medicine, Robert P. Henderson, vice-president of Honeywell's North American Computer Operations, said whether national health insurance eventually covers dentists, psychiatrists or get-well cards, it "cannot operate without the medical computer."

Henderson

"The medical computer is the only instrument we have that is able to cope with the complex administrative functions and massive data requirements of a health plan covering more than 200 million people," he explained.

But, Henderson added, national health insurance administered via computer systems will have to be carefully handled "to protect the confidentiality of the doctor-patient relationship."

While warning that "unrestricted encroachment" of the computer into medical recordkeeping could destroy personal and professional privacy, he also characterized the machine as "an oft-indicated nonconspirator. By its very nature, the computer is incapable of robbing a bank or burglarizing a doctor's office."

"But, admittedly," Henderson continued, " it has been used to commit such crimes. Our task is to make it impossible for the real criminals to operate."

Calling for the development of a high level of security to protect computer data banks established to administer the national insurance or any other health plan, Henderson charged computer manufacturers, government agencies and the medical community with the responsibility for providing the necessary safeguards.

He pointed out a number of security techniques available to computer users. These include coded user-ID cards, special transmission signals and "rings of protection" to keep sensitive information from the probes of unauthorized users.

# Editorials

## *Theory Just Not Enough*

University education is woefully inadequate to prepare students for the real world of business data processing, a fact that was eloquently articulated by Afips' president, George Glaser, at the recent Educom conference [CW, Nov. 6].

But Glaser in some ways missed the mark by placing most of the blame on computer science departments in large and small universities. The educational failure is not so much the fault of just the computer science department but of the entire university.

We need trained computer scientists as they are being produced today for the theoretical side of computing: to accomplish the basic research in computer science and to lay the groundwork for future advances in systems over the next few decades.

On the other hand, however, we also need people trained in applying the present technology to the business environment.

This second group should *not* be trained in computer science per se but rather should receive the body of their training in the more traditional business and accounting areas with a heavy minor in computer appreciation and the basics of computer science.

Computer use is becoming more applications-oriented all the time and, in many – if not all – cases, understanding of the applications area is more important to effective completion of an installation than is "computer science."

Many of the problems in the past with implementation have been caused by computer scientists supplying solutions to the wrong problems because they had little or no understanding of the environment of the business.

This can only be overcome by getting computer science out of the computer science departments alone and introducing it in a wide range of university departments that are more oriented toward the real world – if that is really possible in the university environment.

## *A Stronger Commitment*

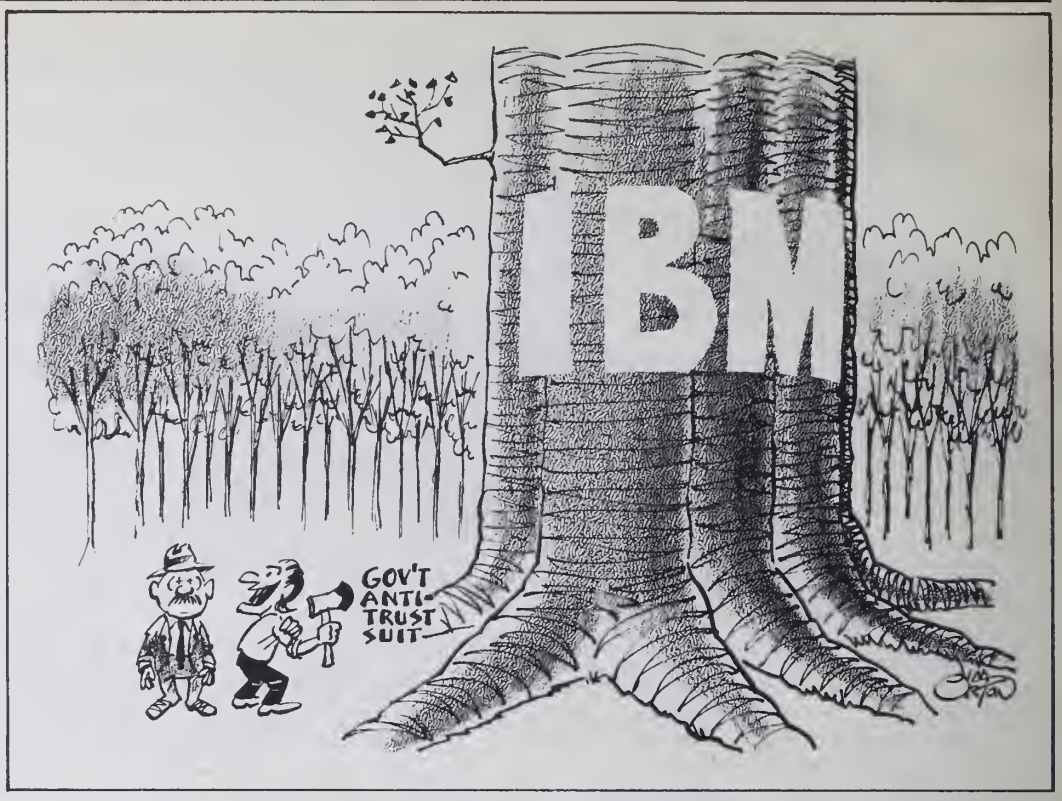
With this issue, we have begun labeling reader-submitted opinions "Reader Commentary" instead of "Viewpoint" as in the past.

While the move is in many ways cosmetic, it does reemphasize our commitment to serve as a forum for all of our readers' opinions, whether they agree or disagree with our editorial policies.

We feel it is our duty and responsibility to air the opinions of all in the computer community and are taking this opportunity to invite all readers to correspond with the other members of that community through us.

As in the past, short contributions – under 150 words – will usually be treated as Letters to the Editor while longer material will be used in the commentary section.

So if there's something you feel strongly about – concerning the use of computers or the "profession" – be it technical, political or social – write it down. We welcome all comments.




**'Matches or Toothpicks?'**

# Letters to the Editor

## Privacy Legislation Unavoidable; Let's Hope for the Right Kind

The theme of the editorial, "Will We Be Forced to Accept Mandated Privacy Controls?" [CW, Oct. 23], depends, as you say, upon this trade we indulge in becoming "professional."

I am of the opinion that the variously styled friendly societies which we are wont to call "computer societies" have no hope of ever being more than toothless advisers. I think that the specter of legislation cannot be avoided – my own hope is that the right sort gets enacted.

Let me illustrate:

"Computer Society XYZ, Inc.", hereinafter called XYZ, Inc., has a scheme by which people can be assessed and graded for admission to that august body.

Let us assume that Mr. ABC has reached the pinnacle of his vocation and has been made a Fellow of XYZ, Inc. Now, something happens and doubts develop about Mr. ABC. What is XYZ, Inc. going to do?

If XYZ, Inc. casts out Mr. ABC, what protection does it have against being sued destitute by Mr. ABC? Answer: If Mr. ABC can prove damage to his prospects (whatever that may mean), nothing.

And if XYZ, Inc. successfully casts out Mr. ABC, what recourse has Mr. ABC against an employer or customer who tries to unload him as well? Answer: If Mr. ABC can prove that nothing substantial which in any way violates any agreement or contract has been proven, everything.

The only way to stop Mr. ABC "getting his own back" is for governments to provide legislation which creates a statutory body to which the task of measuring DP professionalism is given.

This body would have power to prescribe a syllabus and the examinations to go with it, the rules of conduct (code of ethics, if you prefer), the power to proscribe certain jobs to "unqualified" persons and the power to admonish and "de-register" members of the society or union.

Once such a system is set into operation, I think that matters such as the operation, safety, security, correctness, etc. of DP installations will be more easily controlled since lack of the prescribed safeguards can result in action against the people responsible. Furthermore, what constitutes "prescribed safeguards" can be left to the statutory body.

Lester James Devaney

Wellington, New Zealand

## Capabilities of PL/I Show Fortran Not Necessarily Better

I am certain R.A. Baker [CW, Oct. 30] did not obtain his information from the PL/I Optimizing Compiler manual.

For one thing, based vaiables can be passed as parameters and for another you can READ into parameters. As for not being able to read in a variable format, both Cobol and PL/I do not have a need for this since the data can be read in and then various structures "overlaid" upon the data to "pick it apart."

Concerning the comment about statement numbers/labels, in the structured programs we have written we have had very little need for them, and besides the mnemonic labels in PL/I are more meaningful than the statement numbers in Fortran.

Furthermore, I do not find the Optimizing Compiler encourages sloppy programming. On the contrary, it encourages more standardization through its increased error-checking at compile time and the program-formatting capability of the Checkout Compiler.

This is not intended to be an outright blast at Fortran; I like the language, but PL/I as it exists is a significantly better language than Fortran VI or Fortran X would ever be.

James P. Holtman

Greensboro, N.C.

## A Mule With Painted Stripes Does Not a Zebra Make...

D.G. Bauman's letter on the pros and cons of the Certificate of Data Processing [CW, Oct. 30] appears to be a very rational and commonsensical comparison of the two points of view. I happen to support Bauman and Fred Twepesta in this approach to the emotional area of "professionalism."

Sometimes we forget that even though we paint black and white stripes on a mule, we do not have a zebra. On the other hand, a mule and zebra can be trained to perform the same task in a similar manner, but the animals have not been basically changed.

G.L. Hammon

Austin, Texas

## Expect Less Speed With VS

Donna Pyle's findings regarding VS as reported in *Computerworld* Oct. 16 just don't measure up.

It isn't reasonable to expect CPU cycle time to speed up just because you've switched from OS to VS on the same hardware. In fact, considering system overhead, execution time should increase.

By analogy, given the same recipe and temperature, a blast furnace couldn't bake a cake any faster than a conventional home-style cooking range. Naturally, the overhead would go up a little.

But if the economies and efficiencies attendant to the increased capacity were to be considered . . . but then Pyle probably doesn't bake cakes either.

Marvin C. Cruzan

Kansas City, Mo.

*(Other letters and reader commentaries on Pages 13, 14 and 16.)*

# Dear Computerworld:

**I (borrowed) (stole) (shared) (copied) this issue of *Computerworld*, and it made me:**

- ☐ PROUD
- ☐ SKEPTICAL
- ☐ ANGRY
- ☐ PLEASED
- ☐ INVOLVED
- ☐ AWARE
- ☐ CURIOUS
- ☐ EXCITED
- ☐ DEMANDING
- ☐ FURIOUS
- ☐ INFORMED
- ☐ SURPRISED

☐ ALL OF THE ABOVE

☐ **PLEASE ENTER MY SUBSCRIPTION (details on back)**

Put old label or label information here

☐ **I'm already a subscriber, but I'd like you to change my:**

- ☐ **address**
- ☐ **title**
- ☐ **industry**
- ☐ **other**

My current mailing label is attached and I've filled in new information on the other side.

Note:
Please fill out form on back, detach and insert in post-paid envelope attached through binding.
Thank you.

COMPUTERWORLD

*Please send me* **COMPUTERWORLD** *for 1 year* RATES: U.S. - $12 Canada and PUAS - $20 Other foreign - $36

☐ Check Enclosed
☐ Charge My American Express Account

If charge we must have cardholder's signature:

| | | | | |
|---|---|---|---|---|
| First Initial | | Middle Initial | Surname | |
| Your Title | | | | |
| Company Name | | | | |
| Send to: Address | | | | |
| City | | State | Zip Code | |

*Address shown is:*
☐ Business
☐ Home

☐ Check here if you do not wish to receive promotional mail from *Computerworld*.

**COMPUTERWORLD**

**CIRCULATION DEPT.** 797 Washington Street, Newton, Mass. 02160

PLEASE CIRCLE 1 NUMBER IN EACH CATEGORY

BUSINESS/INDUSTRY
10 Manufacturer of Computer or DP Hardware/Peripherals
20 Manufacturer (other)
30 DP Service Bureau/Software/Planning/Consulting
40 Public Utility/Communication Systems/Transportation
50 Wholesale/Retail Trade
60 Finance/Insurance/Real Estate
70 Mining/Construction/Petroleum/ Refining
75 Business Service (except DP)
80 Education/Medicine/Law
85 Government - Federal/State/Local
90 Printing/Publishing/ Other Communication Service
95 Other: _____

TITLE/OCCUPATION/FUNCTION
11 President/Owner/Partner/General Manager
12 VP/Assistant VP
13 Treasurer/Controller/Finance Officer
21 Director/Manager of Operation/Planning/ Administrative Service
22 Director/Manager/Supervisor DP
23 Systems Manager/Systems Analyst
31 Manager/Supervisor Programming
32 Programmer/Methods Analyst
41 Application Engineer
42 Other Engineering
51 Mfg Sales Representative
52 Other Sales/Marketing
60 Consultant
70 Lawyer/Accountant
80 Librarian/Educator/Student
90 Other: _____

**Detach here, fold, and place in post-paid envelope attached through binding.**

## One a Coercive Monopoly

# Damning AT&T and IBM in One Breath a Mistake

By Joe Wright
Special to Computerworld

Although both IBM and AT&T are certainly dominant in their respective industries, they cannot properly be lumped together for equal damnation as argued by A.G.W. Biddle, executive director of the Computer Industry Association, at the recent National Retail Merchants' conference [CW, Nov. 6].

The crucial difference between IBM and AT&T is that the latter is a coercive monopoly while the former is not. A coercive monopoly is a monopoly that can prohibit competition. Competition can be prohibited only by the government and it is only through the power of government that AT&T is shielded from competition.

IBM has no such power and has earned its market position through free trade on a free market (to the extent that the market has been free). It has numerous competitors whose actions provide restraints on IBM's pricing and incentives to technological progress. Several of these (or combinations of these, if it weren't for antitrust laws) could seriously cut into IBM's market by offering superior products and services at lower prices.

The fact that IBM has maintained its market position in the face of diverse competition from frequently lower-priced offerings is proof that the majority of the users have thought over many, many years that IBM is the best deal in town, everything considered, and polls of users confirm this.

And here, let's not be fooled by Biddle's bull about users being "locked in" to IBM or about IBM's tremendous, overwhelmingly irresistible marketing power. Any user can toss IBM out on its ear at any time – contract or no contract – if IBM defaults on its commitments. Of course such an action may prove extremely costly – but so would it with any other vendor.

**Reader Commentary**

And as for IBM's "oppressive" marketing tactics, I submit that, more often than not, they are cited to cover up and excuse user weakness and apathy. IBM cannot force its way into anyone's shop – and if you don't want IBM salesmen coming around, simply tell them to stay the hell out!

Such is not the case, however, with AT&T. It is an authentic coercive monopoly that only recently has been subject to (very limited) competition and only because of a loosening of the regulatory prohibitions of the Federal Communications Commission. Unlike IBM's users, AT&T users are indeed locked in, if they are to have communications services at all.

Until recently they have had no alternatives. And right now they have only a few. Why? Because of government-granted monopoly power.

The result of this arrangement has, of course, been (1) an incredible lack of innovation and technological progress, (2) a decline in quality of service, (3) erratic and seemingly unjustified price increases and (4) bizarre pricing and service policies (for example, charging $7,000 to $8,000 to install a device that may subsequently rent for a couple of dollars a month or charging $100 or more for a special colored plastic housing on a common telephone or having to "engineer" the installation of a simple on-off switch).

### Repeal Laws

The AT&T monopoly can be busted up by repealing the laws that created it. Anyone who can come up with the financial, technological and managerial wherewithal should be free to offer communications equipment and services – including AT&T, who should not be penalized and handicapped by new government regulations.

In communications, in data processing, in all industries the market should be opened up. Trade should be freed of *all* government regulations so that production can increase, so that innovation will be spurred, so that choices will be widened and so that prices will come down.

*Wright is assistant manager of North American Reservations and Communications at Icelandic Airlines, Inc.*


'And Now We'll Hear From the Opposition . . .

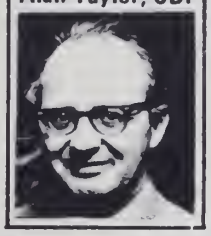
## Hardware Costs to Crash

# Mic-Squared Systems Will Be the Challengers of FS

"Microcomputer "is a descriptive but fairly long term. If you add to it another qualifier that is just as long, it becomes a mouthful. And if that qualifier is "microprogrammed," the result is simply verbally indigestible.

Yet "microprogrammed microcomputers" is what this column is about, and both parts are important, so the name Mic$^2$ systems will have to do. These appear to be the real challengers for commercial computing dollars in the years ahead – challenging the IBM Future Systems (FS) themselves.

**The Taylor Report**
**By**
**Alan Taylor, CDP**



The challenge is put out most specifically in a book published by General Automation, Inc. called "The Value of Micro Power." The relevant part says:

" . . . The grossly inflated prices that the established computer manufacturers charge for their medium- and large-scale computers are propped up by the massive number of computer programs that have been developed for these machines since 1960. So huge would be the cost of reproducing these programs on cheaper computers that in any replacement situation it would be uneconomical to take a computer with a different instruction set, even if it were free. But microcomputers change all that. We are already close to the day when expensive medium- and large-scale computers can be functionally reproduced by cheap minicomputers. At that time the problem of reprogramming expense will disappear since existing programs will run without modification on the new microcomputers."

You can't get much more specific than that without announcing a product, and neither General Automation nor anyone else has announced such a product as yet.

The development of microcomputers during the past decade, and particularly in the past two years as the technology went from a computer-on-a-chip to the modern computer cards, is not something at which we can sneeze. Nor can its sales volume, now approaching the 10,000/mo figure, be ignored.

But can it really be done? Is there any other reason to suspect that the claims may be at least half-way right?

### FS Questions

I think there is, and I think the reason concerns one of the problems now being raised for FS as the concepts behind these suggested replacements for the System 370s become better known. Last month, for instance, the *Wall Street Journal* discussed whether the computer market was ready for the systems.

The meeting minutes of IBM's management and management review committees give no reassurance that the computer market will be ready to accept the FS concepts. Indeed, the basis for the inauguration of the FS systems design was *not* the attractiveness of the FS systems but the weaknesses of the 370s and the fear that IBM would be unable to prolong their life until the 1976-1977 era.

This fear apparently made it imperative that the replacements should be revolutionary, not evolutionary. IBM knew in 1970 that it had to jump ahead in the 1975-1978 era. Ahead, apparently, of the market.

The idea of IBM being ahead of the market is an unfamiliar one. Since the development of the 305 Ramac over a decade ago, IBM has consistently been waiting until the market was ripe and the techniques were thoroughly understood before marketing anything. Its operating systems of 1965 came five years after the Burroughs, Honeywell and Ferranti operating systems. Its virtual memory came a decade after Burroughs had virtual. Only in one area has IBM really pioneered technically, and that was in 1965-66 with the use of microprogrammed emulation of earlier computers – that is, exactly in the one area that General Automation has now singled out as the way to bring the hardware costs of future FS competitors crashing down.

So the type of threat now posed is one which IBM engineers would have no trouble understanding. It was indeed the basis of their own success in fighting off Control Data and Honeywell 10 years ago.

### Safeguards Also Seen

Moreover, there is a distinct weakness in the Mic$^2$ argument that, as soon as a user brings his programs to a suitable system, he can run them on it.

Users nowadays no longer own their own programs completely. They may own at best some RPG or Cobol source language, but the Cobol source is by no means hardware-independent.

The same major computer manufacturers whose products the Mic$^2$ may challenge each have their own proprietary and subtly different Cobol compilers, so the Mic$^2$ systems would have to emulate the individual compilers as well as the machines.

And users of application programs today are normally licensees of the same major computer manufacturers. Their licenses are restricted ones which don't let them walk away with the programs at all!

(Curiously enough, the practice of licensing application programs came in 1969 – just as the decision to go ahead with FS was given. It *could* be coincidence, but on the other hand it does provide a good protection against the same threats now posed by the Mic$^2$ development, so that could also have been part of the design.)

So there you have it. This is the challenger that is now emerging. For those who are interested in the physical realities behind all this I would recommend reading "The Value of Micro Power" and its companion, "The Value of Power," both published by General Automation, 1055 South East St., Anaheim, Calif. 92805.

They are good background reading for all who like to see where the future is coming from, as well as how the present works.



UPI Photo

Earlier this month MIT's chairman of the board, Dr. Howard Johnson (right), watched as Nasa administrator Dr. James Fleteher (left) presented President Gerald R. Ford with a space-grown crystal. Nasa said really minute computers someday may eome from spaee erystal factories, so don't expeet eomputer evolution to stop with this year's technologies. (See story for one development that's nearly here.)

# Associative Processor Not Cost-Effective For Proposed Uses

By M.J. Viehman
Special to Computerworld

Large associative processors (AP) such as Goodyear's Staran, far from being pioneer innovations, are probably the most conspicuous existing waste of computing power. These machines can be shown ineffectual at the jobs which they are supposed to solve: air traffic control, information retrieval, etc.

The question here is not whether a problem can be solved in a particular manner or whether a system can be constructed to perform as an AP; both of these things are known. The question relating to reason for existence is use – economy. Are large APs cost-effective in light of present knowledge of problems, machines and construction of solutions?

The answer is no and a base inductive proof is given in nonmathematical terms. In many problems of air traffic control, information retrieval, statistical processing and pattern recognition center on what can be loosely called the correlation problem: finding coordinates close to a given track, finding the bit pattern "close to" the retrieval value, cluster or pattern.

## Reader Commentary

What happens in an AP that is large enough to hold all the active tracks, data base, etc. is that each bit of the search argument is compared (in parallel) with each bit in the data base. Now from information theory and practical considerations, after the first several of these comparisons, most of the comparisons need proceed no further – i.e., the search has failed on these items. For any reasonable system this has to be the case; if not, you can't discriminate between the aircraft under the systems responsibility, the data matches all (or most) of the data base or other such nonconclusive conclusions.

The question is why we put all that circuitry to work to find answers that are already known. Isn't it more cost-effective to think more about the problems? The answer is yes.

Suppose we rearrange the same or less circuitry to maintain and search an "ordered" data base. Essentially what the processor will do is what an operator observing a display of the data would do: only query items close to the interesting values.

Applying these techniques reduces problems seeming to require on the order $N^2$ operations to solutions requiring order log N operations. Since APs grow according to N, it should be possible to do the same job in the same time with only a processor of order log N.

*Viehman is a senior engineer at Tetra Tech, Inc.*

# WHAT WOULD YOU CALL A POLLABLE TERMINAL WITH ALL THE FEATURES OF THE HAZELTINE 2000?

# WE CALL IT THE HAZELTINE 3000


# YOU'LL CALL IT FANTASTIC!

The Hazeltine 3000 terminal has a programmable microprocessor-based communications interface that makes it compatible with communications disciplines of most computer manufacturers. It has the features that make communicating so much easier—powerful local editing capability, protected formatting with dual-intensity video, full-size 1998-character display, uncluttered moveable keyboard, and a full range of options. It's a "custom" terminal at an "off-the-shelf" price: $125 per month (12-month rental, maintenance included)...and it's backed by worldwide sales, service and technical support from the Company with a half-century of leadership in electronics and displays! Fantastic!

**Hazeltine**
Corporation Computer Peripheral Equipment, Greenlawn, N.Y. 11740 (516) 549-8800 Telex 96-1435

*East:* N. Y. (212) 586-1970 ☐ Boston (617) 261-5867 ☐ Phila. (215) 676-4348 ☐ Pittsburgh (412) 343-4449 ☐ Wash., D.C. (703) 979-5500 ☐ Rochester (716) 254-2479
*Midwest:* Chicago (312) 986-1414 ☐ Cleveland (216) 734-5363 ☐ Detroit (313) 355-3510. *South:* Dallas (214) 233-7776 ☐ Atlanta (404) 393-1440
☐ Houston (713) 783-1760 ☐ Orlando (305) 628-0132. *West:* San Mateo (S.F.) (415) 574-4800 ☐ L. A. (213) 553-1811 ☐ Denver (303) 770-6330 ☐ Seattle (206) 242-0505

# Letters to the Editor

## Misrepresentation in Ads Real Culprit of 'Layla'

The ECI Software Corp. Layla ad, in all probability, was offensive to many people, particularly those who feel persecuted or rejected in our current crush to stamp out discrimination in a thousand areas.

I feel compassion for Julie Wilson [CW, Sept. 11] and Paula Berg [CW, Oct. 16], but sincerely feel that gross misrepresentation of facts in advertising is the real culprit and that the "eye-catchers" are a result of frustrated advertising people.

When the advertisement agencies quit trying to insult the intelligence of their readers, perhaps eye-catchers won't be needed.

Douglas Steiner
Grand Junction, Colo.

## She Was Offended Even in Retrospect...

I have been reading the letters about the Layla ad. Even though I am the president of the local National Association for Women chapter as well as a faithful reader of *Computerworld* I have never noticed the original ad. However, upon reading the first two letters, I looked it up in the library and concluded it was indeed an offensive ad.

It does my heart good to see the Louis Mills letter [CW, Nov. 6] because he seems to be as much repelled by sexually suggestive advertising as I (and probably many other women and men) am. I hope that CW can edit out any future contributions or ads of this type.

Sally F. Dennis
T.J. Watson Research Lab
Yorktown Heights, N.Y.

## ...And So Was He

Please add my name to the growing list of those offended by the sexism of the Layla ad. I am only sorry I didn't write sooner.

Daniel D. McCracken
Ossining, N.Y.

## Naive User Deserved It

In regard to Glenn W. Graham's article "Installing MRP: How to Do a One-Year Job in Six," I had to laugh at his predicament. His situation is so typical of first-time users who are too stupid to do the obvious.

These users should pay a responsible DP manager to come in and explain at the beginning what it took Graham six years to find out. He deserved exactly what he got.

Mickey V. Anderson
Alexandria, Va.

## Random Notes

### System 2000 Report Writer Extended to CDC Equipment

AUSTIN, Texas – A new version of the report writer feature for data management System 2000 from MRI Systems Corp. provides installations with Control Data Corp.'s 6000, Cyber 70 or Cyber 170 CPUs (running under Scope, Kronos or NOS) a nonprocedural means of generating user-formatted reports.

The CDC report writer module is available for $15,000. The basic System 2000 costs $30,000, MRI said.

MRI is at P.O. Box 9968, 78766.

### PDP-11 Programs Cross-Assembled

WOODLAND HILLS, Calif. – The X-11 cross-assembler from Compata, Inc. permits Digital Equipment Corp. (DEC) PDP-11 programs to be assembled on "any" host computer that supports an ANS Fortran compiler with 24-bit or larger integers.

A macro library and card image input produce an output listing in Macro-11 format and a binary file suitable for input to Link-11, DEC's linkage editor. X-11 is available for a one-time charge of $3,500 from Compata, 6150 Canoga Ave., 91364.

### 'County' Computes Land Parcels

COLUMBUS, Ohio – Compu-Serv Network, Inc. has installed a property management program that computes the area of real estate parcels and generates one or more plots of each parcel on an automatic graphics system.

The program, named County, was developed primarily for governmental officials to check deeds and update county tax maps. It is available in remote time-sharing and batch processing modes on Compu-Serv's Decsystem-10s.

Input to the program consists of bearings and distances obtained from deed descriptions or survey data. The bearings may include any number of reference points and any number and combination of straight and curved boundary lines.

Multicolor output can be obtained on a variety of materials, including Mylar, from the firm's California Computer Products, Inc. Model 7000 graphics system. The system includes an automatic drafting unit that operates at speeds up to 42 in./sec with "extremely high accuracy," Compu-Serv said.

The network is based at 5000 Arlington Circle Blvd., 43220.

### Clarification

The Univation system of work measurement and control now available on the Acts Computer Corp. network, headquartered in Southfield, Mich., [CW, Sept. 25], runs on a remote job entry basis to IBM 370/155s.

## IBM In-House System

# CMIS Controls Multiplant Manufacturing

By Don Leavitt
Of the CW Staff

BOSTON – Though some effort has gone into developing the financial application portions of management information systems for manufacturing companies, very little work has yet been done in the manufacturing areas themselves.

There are exceptions, however, and at the recent Nerem 74, P.F. Bacigalupo of IBM's Waltham, Mass., facilities described his company's development and implementation of what is called a "common manufacturing information system" (CMIS) for its own internal use.

CMIS was conceived in the late 1960s as a means of supporting the growing interdependence among IBM's North American data processing plants.

A terminal-based system which uses standard format data bases at each location, CMIS is generally an operations management system and not, he stressed, a top management system.

"To be effective, CMIS must be independent of organizational boundaries," Bacigalupo added. Noting repeatedly that the ideas behind CMIS could be used by any manufacturer, he explained that the system addresses three major functions: operations planning (requirements generation), material logistics and manufacturing management information.

CMIS provides real-time response to inquiries and batch reporting. As a communications vehicle, it provides multiple locations within a plant with a single data base of information. Although each plant has its own DP capability, there is a "manufacturing central" operation in the IBM scheme, the planner continued.

Much effort was devoted to standardizing data file formats, data element names, size and definitions. This approach was also applied to application programs and the choice of hardware.

The scope of CMIS provides for the exploding of the product schedule into a materials plan, controlling the release of orders for purchasing and manufacturing and controlling the stocking of resultant parts and subassemblies. The cycle of issuing subunits to the manufacturing floor and stocking the ever larger subassemblies continues through the final assembly process of building machines according to customer orders, he said.

The nine subsystems defined in CMIS were assigned to specific plant sites for development responsibility. The approach was to have a centralized systems design team, he said, with program coding and testing done at the separate plant sites.

Plants would then implement the subsystems on a staggered basis. But, he added, the actual history of system development in the project brought about organizational as well as implementation changes.

Two plants were picked to implement all the subsystems and that brought about a rescheduling of the entire project. "As with any complex project, much can be – and in this case was – learned from initial problems."

Justification for CMIS, as for any project, lies in both tangible and intangible benefits, Bacigalupo told his audience. Just about two-thirds of the tangible benefits were expected to come from improved inventory control and better management of information systems manpower. Cutbacks in user personnel needs, reductions of purchasing costs and miscellaneous savings from less scrap and lower communications costs were expected as other tangible benefits, he said.

# MMS Ledger Update Supports Account-Oriented S/3 Data Base

ANDOVER, Mass. – Installations with 24K or larger IBM System/3s have the opportunity to impose control over allocation of expenditures and budgets and to extract both fixed and special reports with a new version of the MMS General Ledger system from Software International.

Originally developed for IBM 360/370 users, the system allows both financial and statistical data to be stored, modified and retrieved from an account-oriented data base.

Each account in the user's ledger system has a record in the base. Each record includes an account number with as many as 24 digits, an account type indicator and the balance currently in the account.

In addition, there are as many as 13 periods of actual experience for both the current and the previous year for comparative studies, the account total budget for the current year and the spread of that total into as many as 13 periods for comparison to "actuals."

The system provides users with flexibility in designing their charts of accounts, the company said. Account relationships are defined and their hierarchies can be modified by the user, without depending on an imposed renumbering of accounts to show new logical groupings.

The relationship file permits users to maintain different charts for various subsidiaries and still be able to summarize dollar values or statistical figures up through an unlimited number of levels, the vendor said.

The program is written in ANS Cobol but supplied only in object code "to discourage users from tinkering with it." It requires Release 11 or later of System/3 control software to function properly, the spokesman said.

The rental fee is $250/mo on a four-year lease plan, plus an installation fee of $1,500, the company noted from Elm Square, 01810.

# Subroutine Package Enhances Nova's Computational Features

SOUTHBORO, Mass. – Double-word arithmetic and double-word format conversions are among features available to Fortran programmers working on Nova minicomputers with the Commercial Subroutine Package (CSP) just released by Data General.

Character field adjustments and real-time multiterminal support are also part of CSP. That range of computational and formatting capabilities makes the package particularly useful in formatting reports and data messages in instrumentation and control, computational and data communications applications, a spokesman said.

CSP expands the capabilities of Data General's Fortran IV and Fortran 5 processors while providing support for inputting, editing and outputting of data arrays in formatted or unformatted manner.

The subroutines are compatible with all the functions of Data General's Real-Time Disk Operating System (RDOS).

The package is set up as a library of callable subroutines so the user may select only those that are needed. The calling sequences, said to have error validation similar to other Fortran library routines, allow manipulation and conversion of data entered from terminals, cards and paper tape, as well as files stored on fixed- or moving-head disks, magnetic tapes or cassettes.

Editing of character strings into structured output includes insertion of dollar signs and suppression of leading zeroes, the spokesman said.

CSP is available now without cost to Data General Fortran users. It can run on any Data General computer with a minimum of 16K bytes of main memory.

## Sysgen Made Simple--Part 2

# 'P' Macro Links Source, Job Statements

By Robert T. Alexander,
James M. Blackford and Fred Schuff
Special to Computerworld

*In the first article of this series, the authors outlined the basic steps in an operating system generation and the parameters they utilize to simplify the SYSGEN procedure. In this article they provide details on the macros and other coding techniques used to implement these basic concepts.*

**Concepts and Techniques**

The "SYSGEN Made Simple" procedure required several user written macros (P, SETP and PEDIT). The most important was the "P" macro which allowed the one-for-one correlation of assembler language source statement to job stream statement.

The format for coding the P macro statement is as follows:

bPb'.....1-71 text characters .....'[,X]

This would require a statement of up to 78 characters. Setting the value ICTL 1,80 for the assembler allows full access to the entire 80 columns of the source statement records. (The optional parameter (,X) denotes that continuation is to be indicated in column 72 of the generated record which is written to SYSPUNCH.)

The "P" macro acts as a front end to the PUNCH statement. For each execution of a "P" macro statement, a PUNCH statement is constructed and executed.

The normal processing of the assembler handles the substitution of values for symbolic parameters, generation of a single quote where two appear, and generation of a single ampersand where two appear. Therefore, the text within the literal must be processed to align the continuation character in column 72 of the output records (SETP macro).

This creates standard records of JCL and assembler source statements. The generated output records contain a supplied user deck identifier in columns 73-76 and an internally generated sequence number in columns 77-80.

Looking at a sample of the SYSGEN master deck in "P" macro format illustrates the facilities this procedure provides (Figure 1).

Prior attempts to use the facilities of conditional assembly have been made within the STAGE-1 source deck but this method required that when choices were made, there had to be multiple copies of each complete macro with the entire set of parameter values coded in each separate copy. Using the "P" macro facility allows for the construction of the STAGE-1 macro statements by

*(Continued on Page 19)*

```
R '//*  ------------------------------------------------------------------- '
P '//STAGE1   EXEC PGM=IEUASM,RARM='NDLOAD,LIST,DECK,XREF'',REGION=120K  '
P '//*        ------------ ASSEMBLE STAGE 1 DECK                 ---------- '
P '//SYSPRINT DD  SYSOUT=A                                                '
P '//SYSGO    DD  DUMMY                                                   '
P '//SYSUT1   DD  DSN=SYS1.UT1SDS&SYSTEM,DISP=SHR                         '
P '//SYSUT2   DD  DSN=SYS1.UT2SDS&SYSTEM,DISP=SHP                         '
P '//SYSUT3   DD  DSN=SYS1.UT3SDS&SYSTEM,DISP=SHR                         '
P '//SYSLIB   DD  DSN=SYS1.GENLIB,DISR=SHP                                '
P '//         DD  DSN=SYS1.DMACLIB,DISP=SHP                               '
P '//SYSPUNCH DD  DSN=SYS1.GENPUN&SYSTEM,DISR=SHP                         '
R '//SYSIN    DD  *                                                       '
P '         TITLE ''STAGE 1  OS SYSGEN S/370-158   MVT REL-21.7''       '
P '                                                                     '
P '         REPRO                                                       '
P '//STAGE1I  JOB (ASA012SOFTOO1,''MVT-21.7 GEN 2'',CLASS=K,            ',X
P '         REPRO                                                       '
P '//           REGION=256K,MSGLEVEL=(1,1)                              '
        AIF   ('&TSO' EQ 'TSO').SG0064
        AIF   ('&TYP' NE 'ALL').SG0057
R 'GENERATE GENERATE   GENTYPE=ALL,                                     ',X
        AGO   .SG0064
.SG0057 ANOP
P 'GENERATE GENERATE   GENTYPE=(&TYP,&N),                               ',X
        AGO   .SG0064
.SG0060 ANOP
        AIF   ('&TYP' NE 'ALL').SG0062
P 'GENTSO   GENTSO     GENTYPE=ALL,                                     ',X
        AGO   .SG0064
.SG0062 ANOP
P 'GENTSO   GENTSO     GENTYPE=(&TYP,&N),                               ',X
.SG0064 ANOP
P '                    OBJDDS=SYS1.OBJDDS&SYSTEM,                       ',X
R '                    UT1SDS=(SYS1.UT1SDS&SYSTEM,SLI,                  ',X
P '                    UT2SDS=(SYS1.UT2SDS&SYSTEM,SLI,                  ',X
P '                    UT3SDS=SYS1.UT3SDS&SYSTEM,                       ',X
P '                    UT4SDS=SYS1.UT4SDS&SYSTEM,                       ',X
P '                    UTDISP=KEEP,                                     ',X
P '                    RESTYRE=3330,                                    ',X
P '                    RESNAME=3330,                                    ',X
P '                    PFSVOL=&NEWPS,                                   ',X
P '                    LBMAINT=F,                                       ',X
P '                    ASMPPT=DN,                                       ',X
P '                    LERRT=(LIST,XPEFI,                               ',X
P '                    INDEX=&NDX,                                      ',X
P '                    DIPDATA=PDS,                                     ',X
P '                    JOBSTMT=SUPPLIED                                 '
*
P '         END                                                         '
```

Figure 1. SYSGEN Master Deck in "P" Macro Format

# 'Frend' Reconciles On-Line Data Batches

NEW ROCHELLE, N.Y. – On-line capture and reconciliation of batched data coming into an IBM 360 or 370 from 30 or more video terminals is the design goal of Frend, a package from Quantra Development Corp. that can become, the vendor said, the front end of many application systems.

After capturing data, Frend allows it to be displayed and reconciled with adjustments to a batch header. On-line access to related master and summary files allows additions, changes and deletions, Quantra noted.

Data integrity is maintained with support for both hot core and file recovery routines, total system monitoring and a security approach oriented to the terminals rather than the mainframe, a spokesman said.

Inputs are accepted from CRT terminals, cards, magnetic tapes and disks on-line. Frend supports up to six monetary batch types within one partition or region, and any number of detail transaction types within each batch type. Two levels of reconciliation are available, he added.

Currently, the system can support up to 500,000 details, about 40,000 batches and 10,000 cash letters daily. Since each batch and cash letter must be assigned a unique identifier, total on-line control and selective pageable displays of all batches and cash letters are provided, the vendor claimed.

Disk space for storage of the batches is managed by Frend's queuing function. Since edits and prompting formats are table driven, CRT screen displays may be easily changed to suit new requirements, Quantra added.

At the end of each day's operations, a shutdown function is available to verify that everything that should be done has, in fact, been done. Various monetary summaries and proofs may be run at any time during the day, or after shutdown, to record what has been captured to that point.

Frend can be used under DOS or OS or in an IBM Customer Information Control System (CICS) environment. It is available under license for $50,000.

Installation time varies from one to three months depending on the application, Quantra said from 15 Whitfield Terrace, 10801.

# 'P' Macro Provides Correlation Of Source, Job Statements

*(Continued from Page 18)*

individual values or groups of values.

The one problem encountered was the necessity of duplicating a full 80-character record from the job stream. These records were IEBUPDTE (or IEBUPDAT) data records for modification of released code on the DLIB01 volume or when object decks ("hex" decks) were to be included. This problem was handled via the assembler language REPRO statement followed by the full 80-character record (Figure 2).

Once the master deck was created, the mechanics for generation of the complete job stream for performing a SYSGEN were greatly simplified. To create the job stream, a control deck with the JCL to execute the assembler and the setting of the values for the standard parameter set consisted of about 30 cards. The assembly generates a job stream of about 4,000 records.

A major factor in the size of the generated job stream was the creation of JCL for jobs to submit one or more job steps of the STAGE-II job stream as a separate job for execution. This section of the job stream was created with another special macro, the "PEDIT" macro, which creates JCL to extract the desired step (or steps) from the STAGE-II job stream data set (via IEBEDIT) and creates the necessary JCL to submit the job (via OS or HASP).

In our case, we chose to select each job step as a separate job for keeping track of output and queuing the jobs sequentially for execution.

The most significant obstacle encountered in creating the procedure and master decks was the collection of the complete job streams. The initial preparation was very time-consuming (as is the initial installation of any of the components that went into the master decks). To reduce the effort required, a special utility program was created to convert a standard job stream record to a "P" macro format record.

```
                                        .
                                        .
                                        .
P '//LINKUSER  EXEC PGM=IEWLF840,PARM=''XREF,LIST,NCAL'',REGION=120K      '
P '//*       ---------- LINK USER CSECT MODULE                ----------- '
P '//SYSPRINT DD SYSOUT=A                                                 '
P '//SYSLMOD DD DSN=SYS1.USER,DISP=SHR                                    '
P '//SYSUT1   DD  DSN=SYS1.UTILDS&SYSTEM,DISP=SHR                         '
P '//SYSLIN   DD  *                                                      -'
        REPRO
ESD             USRCSECT                                          00001
        REPRO
TXT             ********  USER CSECT01  ********                  00002
        REPRO
TXT                                                               00003
        REPRO
TXT                                                               00004
                                        .
                                        .
        REPRO
TXT   0         SECT01  ********                                  00020
        REPRO
END                              1360SAS037 210074101             00021
P '     NAME USRCSECT(R)                                                  '
P '//*  ------------------------------------------------------------------ '
                                        .
                                        .
                                        .
```

**Figure 2.** The problem of duplicating a full 80-character record from the job stream was handled via the assembler REPRO statement followed by the full 80-character record.

To update the master decks, standard job streams were processed through this utility, and then the "P" format statements were updated into the master decks. Minor maintenance or modification to the master deck(s) could be handled by creating the actual "P" macro format cards directly.

*The role of a proprietary library package and more details of user coding required to make SYSGEN an easier procedure will be covered in the next part of this series.*

*The authors worked together at the National Bank of Detroit and Alexander is still in the systems group there. Blackford is with Xerox Corp., Rochester, N.Y., and Schuff is now with Coastal States Gas Corp., Houston, Texas.*



# Comserv System 'Does' Processing Of Order Entry Data

MINNEAPOLIS – Terminal-oriented processing of the entire order entry system ties back to a small-scale IBM 360/370 mainframe for users of the Distribution Order Entry System (Does) now available from Comserv Corp.

Functions supported by the system include entry and editing of basic order information, invoicing, handling of inventory information and accounts receivables – including account aging and sales analysis. Remote inquiries for credit information and similar immediate needs are also within the scope of Does, the vendor said.

The use of cassette-based terminals appears to be vital to the system. Keying order information onto the cassettes for later burst-mode transmission to the mainframe, and receiving processed data from the central CPU at high speed on cassette for later slow printing, were both cited by Comserv as the expected way to use the package.

Once received at the mainframe, the data is edited line by line for validity.

At the end of each batch of input, Does transmits whatever error messages are appropriate so items can be corrected for reentry with the next batch entry. Voluminous reports and documents can be directed to a high-speed line printer at user option, Comserv stressed, acknowledging the print units with most terminals might be inadequate for some users.

Does can be integrated into Comserv's previously available CAS III financial reporting system, the vendor said, and indications are that linkups could be made to other financial systems as well.

The system is written in Assembler and Cobol for use on a 360/370 with a minimum 32K bytes of main storage, two disks and three tape drives. It functions under DOS release 26, OS Release 21 or the Customer Information Control System (CICS).

Does is available under license for a one-time fee of $18,000 or $600/mo for three years from Comserv at 3050 Metro Drive, 55420.

# IF WE CAN'T MAKE YOUR MINICOMPUTER SYSTEM DO MORE WORK FOR LESS MONEY, NOBODY CAN.

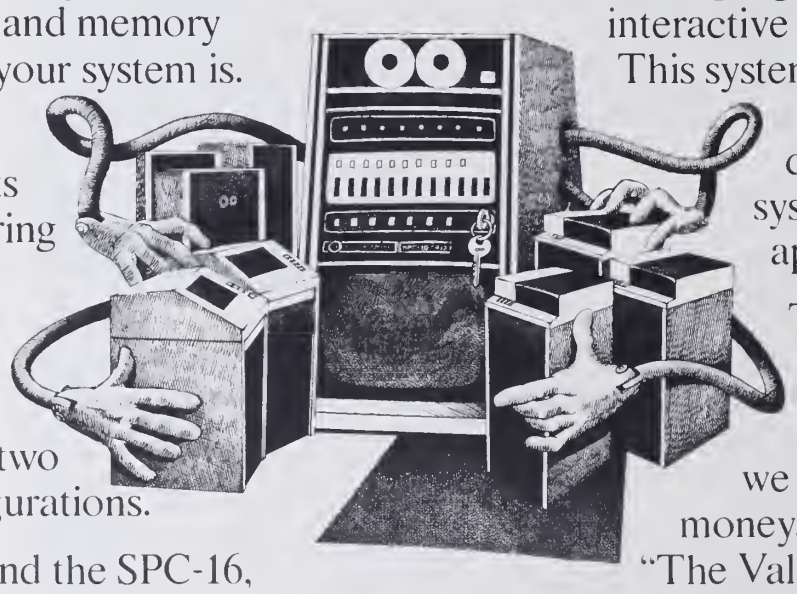
When we introduced the SPC-16, we promised it would be the world's most powerful, versatile, cost-effective family of minicomputers.

It was. It still is.

The SPC-16 isn't the lowest priced hardware you can buy. But it will give you the lowest cost solution.

Through advanced systems architecture, simplified interfacing and a powerful instruction repertoire, the SPC-16 allows you to minimize programming, interfacing and memory costs no matter what size your system is.

**Six mighty minis.**
The SPC-16 family consists of six minicomputers offering a choice of three memory cycle times (800ns, 960ns and 1440ns), memory expansion to 128K using efficient 16K boards, and two different packaging configurations.



If you build a system around the SPC-16, it will do more work for less money than any other system you could build.

And that translates into more profits.

We know it for a fact. In the past few years, we helped a lot of OEMs get the edge on their competition by designing our product into their products. We helped a lot of end users solve a lot of tough, tight-budget applications. And, we produced some cost-effective systems of our own.

**Two hard working systems.**
Take RTOS II for example. It's a multi-programming system offering real-time event driven foreground processing concurrent with background job development and computation.

You couldn't buy a better price/performance solution for applications such as process control, data acquisition, laboratory research, material handling, communications or overall manufacturing automation.

We also built a powerful disk-based general purpose system around the SPC-16. DBOS II lets you do more computation with less memory, in far less time, at a lower price than any system on the market. It offers both scientific and commercial languages and a combination of interactive and batch operation. This system is perfect for service centers, research and development groups and system house dedicated applications.

That's the short form.

To really appreciate how much power we can deliver for your money, write for our book "The Value of Power." It will give you the facts to back up our claim: If General Automation can't make your system do more work for less money, nobody can.

Write General Automation, 1055 South East Street, Anaheim, California 92805. Or call (714) 778-4800. In Europe, write General Automation, S.A., 24 rue du Sergent Bauchat, 75012 Paris, France. Telephone (1) 346/7973. In Canada, write G.A. Computer Ltd., 880 Lady Ellen Place, Ottawa K1Z5L9, Ontario. Telephone (613) 725-3626.

**POWERFUL MINICOMPUTERS BY GENERAL AUTOMATION**

## For Special Monthly Rate

# Bell Defines, Proposes Tariff on Isals

By Ronald A. Frank
Of the CW Staff

ALBANY, N.Y. – Users in New York with certain phone lines that access a CPU may soon have to pay a special monthly rate if a Bell tariff proposal is approved.

The New York Telephone Co. has proposed that data lines be classified as Information System Access Lines (Isal) if they are behind a PBX and are used to access a CPU.

According to the proposal, Isal charges would apply to "dial private branch exchange, Centrex and centralized switching service lines connected acoustically, inductively or electrically to automated subscriber-provided information systems."

The Isal fee would be $15/mo per line but a user would be required to pay a flat yearly rate of $180, the proposal stipulates. It is estimated that about 47 New York Bell customers are currently being charged under special assembly agreements for about 1,000 phone lines.

### Unresolved Issues

The tariff proposal states that acoustically coupled lines would be classified as Isal lines, but it is not clear whether a user would have to pay the extra charges if an acoustically coupled terminal were used part of the time and voice calls were also made from the same phone.

Since the Isal lines are on the user's premises behind the PBX, it also is not clear how it would be determined that a CPU were being accessed or what would happen if an acoustically coupled terminal were moved from line to line as customer usage changed. The tariff proposal includes a statement that an Isal line "may be terminated in a telephone, data set, or data access arrangement." But there is a question whether customers with noncarrier PBX equipment would have to pay the proposed charges, especially if the rate is based on the amount of Bell switching equipment installed at a user location.

Another question to be resolved is whether the Isal charge will be applied to both ends of a line used to access a CPU. Also, since the tariff proposal mentions subscriber-provided information systems, there is some question whether a user with Bell Dataspeed 40 CRT terminals would have to pay the additional charge.

It is believed that Bell will claim PBX extension lines or Centrex lines used to access a CPU will require more equipment than if the same lines were used for voice conversations. Bell's rates for PBXs are usually based on the "predicted quantity of switching equipment related to the number of lines used by the customer," according to one regulatory expert, and Bell may say that more switching equipment is required for lines accessing a CPU.

### User Opposition

The phone company originally filed the tariff proposal on Sept. 5 to take effect on Nov. 5, but it was suspended by the New York Public Service Commission (PSC) until March 4, 1975. The PSC reportedly had raised the issue and asked the phone company to propose a tariff because the Isal rate had been applied under special assembly arrangements to an estimated 47 intrastate users.

Special assembly rates are contracts that are meant to apply only for a limited period and the PSC had asked for a tariff because some Isal customers had been billed for four years under the "temporary" arrangement.

The Isal proposals are not new. They were first raised by Bell companies in Ohio, California, and a number of other states only to be rejected by the various state regulatory commissions. A major factor in these rejections was opposition from user groups such as the Association of Data Processing Service Organizations (Adapso) and time-sharing companies.

Among the users that have indicated a tentative desire to take part in upcoming proceedings on the Isal proposal are a number of New York state agencies including the Office of General Services, the State University at Buffalo, Binghamton and Albany computing centers, the Department of Transportation and others.

In addition, commercial firms using CPUs within New York have expressed an interest in the proposal. One of the largest of these is IBM and a spokesman said, "We plan to attend [the hearings] but haven't yet decided what action to take, if any." It is also believed the Adapso is studying the New York Telephone Co. proposal.

## DAA Rates Down

ALBANY, N.Y. – The recent New York decision which said users can install a Data Access Arrangement (DAA) without having a telephone [CW, Nov. 6] also included reduced DAA charges.

Under the new rates the CDT will cost $1.94/mo, down from the present $2.46; the CBS unit will cost $4.65, down from $6.00; the CBT will be priced at $3.19 instead of the current $4.00; and the CBV power supply will cost $1.15 instead of the present $1.85.

As part of its decision, the N.Y. Public Service Commission said New York Telephone must file the lower rates "no later than Nov. 18, 1974."

Much of the testimony in the case was presented by the Independent Data Communications Manufacturers Association and the decision is expected to set a precedent for similar proceedings related to the DAA which are pending before the Federal Communications Commission.

# Comten Adds 3650 Front End, Communications Net Software

ST. PAUL, Minn. – Comten, Inc. has added an IBM 3704-type programmable front end called the 3650 and has also introduced its Communications Network System (CNS) software.

The 3650's controller can terminate up to 64 lines in any combination of synchronous and asynchronous modes and can support a "sustained data throughput rate of 30,000 char./sec," the company said.

The 3650 can support "all standard IBM terminals" and some non-IBM terminals and the unit has a maximum main storage of 256K bytes with a cycle time of 650 nsec. The front end can operate with both IBM 360 and 370 CPUs and is compatible with the IBM 370X emulation or NCP modes, requiring no changes in host application or teleprocessing software.

Two IBM host CPUs can be simultaneously supported by the 3650 which allows for dynamic network reconfiguration through commands initiated either from the 3650 console or from associated terminals. The front end can be configured as a remote communications concentrator or as a front end.

The 3650 price ranges from $45,000 to $150,000 or from $900/mo to $3,000/mo on a two-year lease.

### New Network Software

Comten also unveiled its CNS software which supports both the 3650 and the earlier, larger 3670 which is comparable to the IBM 3705. CNS can operate in either NCP PEP mode or emulation mode, thus improving on the more limited capabilities offered by IBM's new System Network Architecture, a Comten spokesman said.

IBM's SNA is limited to 370 native mode NCP on the IBM 370X, he said.

The CNS software can support application programs not operational under Tcam or Vtam and it can operate with both 360 and 370 CPUs. Additionally, the software can handle two major IBM software systems concurrently.

CNS is available without cost to users of the 3650 or 3670 front ends from the company at 1950 West County Rd., 55113.

# The Model 40: Did It Deliver on Its Promises?

By Dr. Alan K. Jennings
Special to Computerworld

It has been over a year since Teletype Corp. announced its Model 40 terminal. From the sketchy details first released, it appeared that the advantages of independent TTY-replacement CRTs had disappeared.

The full Model 40 details are out now; a few machines have even been delivered. The Model 40 is not designed, nor apparently was it intended, to be a direct replacement for the Model 35.

Although both are asynchronous devices, the Model 40 is much faster, operating at a transmission speed of 120 char./sec. In fact, a Teletype 4210 magnetic tape terminal is required for the Model 40 to efficiently communicate with the Model 35 or 33.

The features of the Model 40 make it comparable to dozens of nonprogrammable CRT terminals, but it still falls far short of matching the features offered by internally programmable terminals. The Model 40 is basically transmission-compatible with existing communications software for medium-speed asynchronous Ascii terminals.

## Analysis

It does offer special features but with a major drawback: the special capabilities almost invariably require user modifications of existing software. Still, when compared on a feature and price basis, the Model 40 appears similar to many of the so-called superteletype CRT terminals.

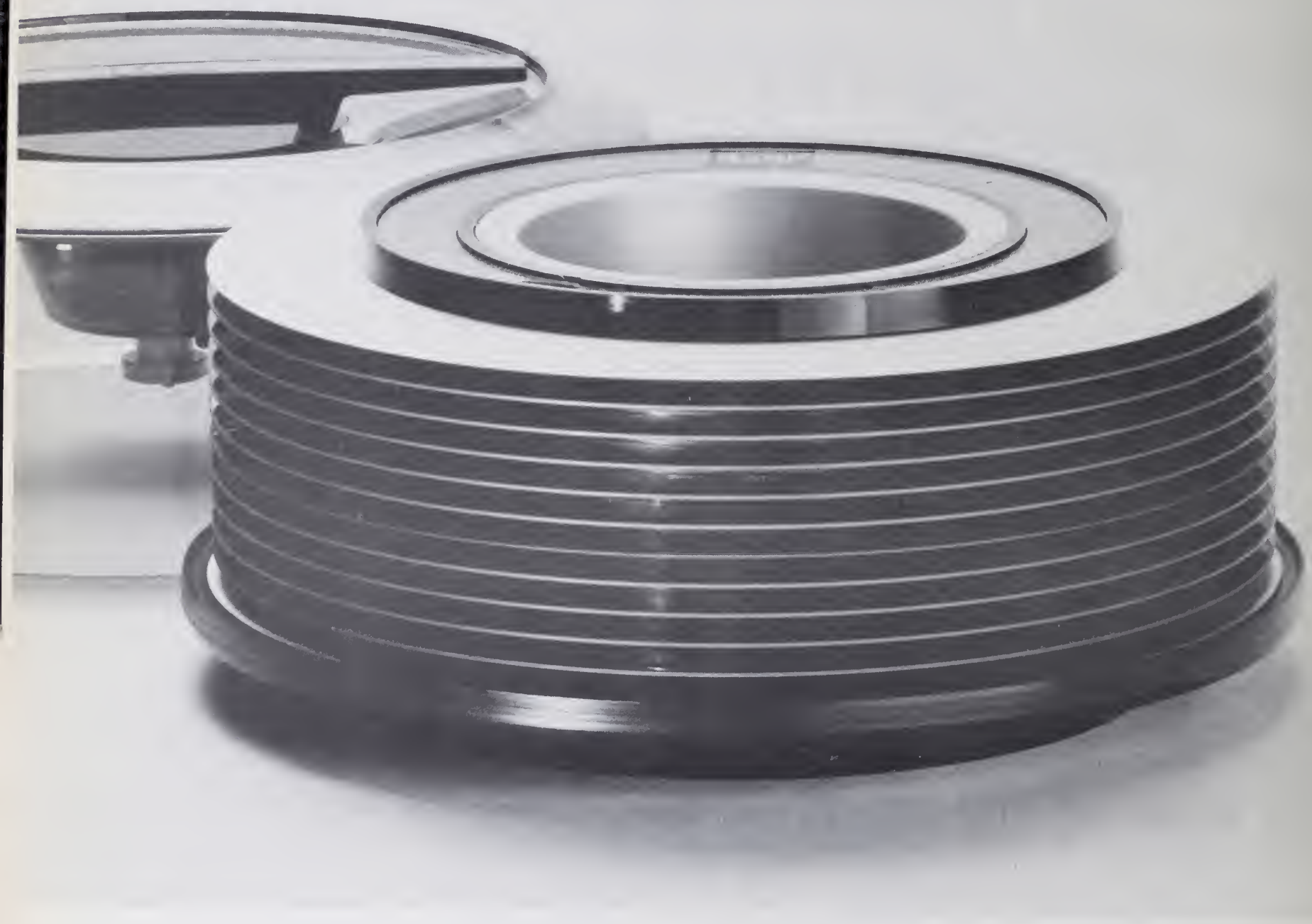
### Technological Advances

The Model 40 is indeed technologically advanced compared with earlier teletypes; it uses a high quality 7 by 9 dot matrix and an MOS refresh memory, provides strong editing features and has been carefully engineered for operator convenience. Its 5-1/4-in. by 11-1/4-in. viewing area is among the largest in the field, and the tube can be tilted to enable each operator to adjust the display viewing angle for maximum clarity.

A total of 1,920 characters (24 lines)

*(Continued on Page 23)*

# If you think all disk packs are alike, take a closer look at the BASF 1236.



Because all disk packs conform to certain industry standards, you might think they're all equal. They aren't. The important difference is the extent to which a manufacturer is willing to go in order to *exceed* industry standards. It's a matter of making a disk pack better than you really need, because there could be times when you need it. Let's look at a few superior points of the BASF 1236 disk pack:

**The binder that won't quit**

As you probably know, magnetic coating doesn't stick to the aluminum disk all by itself. We use a special binding agent to produce an incredibly strong bond. The disk is sealed to prevent oxidation, so you can be sure that the coating won't peel or flake off.

**Our own coating process**

As the trend toward higher packing densities continues, it becomes increasingly important to monitor the thickness of coating deposited on the disk. The problem is compounded by the necessity for progressively varying the coating thickness from the outside toward the inside of the disk, because packing density is greater as the circumference decreases. For those reasons, we've discarded conventional coating methods in favor of an exclusive process using our own BASF-designed equipment.

**A polished performance**

Following the coating operation, we use our own exclusive polishing process to achieve optimum surface regularity. We've been able to achieve a surface so flat that the possibility of a head crash being caused by uneven disks is completely eliminated. We might mention here that the coating and binder formulation, combined with coating and polishing techniques, all are important factors in achieving surface hardness, which is the ability of the coated surface to survive excessive or extended head loading.

**Achieving balance**

Like any rapidly rotating object, a disk pack will behave strangely if not perfectly balanced. In our precision balancing operation, any weighting required is screwed into place, which eliminates the potential of shifting inherent in a conventional adhesive weighting system.

**And to make sure...**

We test our 1236 disk packs to standards much tighter than those of the leading equipment supplier. If anything unpleasant should happen, we'd much prefer it happen here than on your drive. As a regular procedure, we do scratch tests to check coating thickness, impact tests to determine head crash resistance, detergent tests to check resistance to wear and temperature variations, and drop tests to make sure balance and alignment don't shift during shipment. We test to make sure our 1236 disk packs are error free.

**Finally**

Our 1236 costs no more than other twelve-high disk packs. You're already paying for BASF quality... you might as well have it. For more information on the 1236 or other BASF disk packs or cartridges, write to BASF Systems, Crosby Drive, Bedford, Massachusetts 01730.

**You're already paying for BASF quality, you might as well have it.**

BASF

# Did Teletype Corp.'s Model 40 Deliver on Promises It Made?

*(Continued from Page 21)*

can be displayed at any one time, and the Model 40 has an interesting operational feature in its scrolling memory. In addition to the basic 24-line data display, this option permits storing another 24 or 48 lines of data in the terminal without having to go to an auxiliary storage device.

This stored data is divided into three 24-line segments, and any consecutive 24 lines can be displayed at one time. By depressing the scrolling keys, the operator can move data up or down one line at a time. By depressing the segment advance key, the operator can go forward 24 lines at a time.

Particularly with this option, the Model 40 allows convenient preparation and editing of text. It has seven cursor control keys and five editing control keys for data manipulation prior to transmission. Moreover, with the highlighting option, the Model 40 has the capability of field blinking, thereby calling attention to particular segments of data.

### Limitations

Clearly, the Model 40 has some outstanding features – which makes its limitations all the more significant. First, of course, is the relatively slow transmission speed of 1,200 bit/sec. While this is an increase of an order of magnitude over the Model 35, it is still quite slow. CRT communications terminals today commonly operate at speeds up to 4,800 bit/sec and some can operate at 9,600.

Second, and even more significant, the Model 40 is not programmable, a deficiency that greatly limits its flexibility. This deficiency may be attributable directly to the court injunction which restricts Teletype from marketing computer equipment.

The lack of a microprocessor limits the Model 40. For example, its transmission technique is asychronous only, a limiting capability compared with the best of the CRT terminals. Some of these are capable of operating synchronously, asynchronously or directly with a specific computer. Again, all that is usually required is the appropriate read only memory (ROM) and the appropriate one of two or three hardware adapters.

Another example of the flexibility afforded by use of a microprocessor and ROM control memory is evident in the keyboard capabilities. The Model 40 has a fixed-design keyboard, keyboard layout, function keys and editing and control keys are all fixed in the original design.

By contrast, some CRTs provide a number of keys whose functions are determined by user-specified programming. To give even greater flexibility, the keyboard layout and the control and editing key functions can be modified by changing the ROM control program.

Other features are also given up because Teletype didn't use a microprocessor. For example, the flexibility of ROMs offers a variable I/O capability. Serial or line printers, flexible disks, cassettes and magnetic tape drives can be tied in, and the terminal can communicate with them at any time.

All this adds up to very limited flexibility. In effect, a user must design his system specifically for the Model 40, altering his software and sometimes his interface hardware. Clearly, this is a serious drawback.

Another explanation for this inflexible configuration is the fact that, for some time at least, the Model 40 was primarily intended for the use of AT&T. Hence, adaptability to various computer systems was not a primary design goal. If Teletype can hurdle the regulatory barriers, this problem can be solved in adding microcomputer circuitry and memory, effectively making the Model 40 a simple stand-alone computer with sufficient flexibility.

Such an approach would be expensive to the user, of course, increasing the price of the Model 40 substantially, but it would explain the strange packaging of the machine which presently requires a separate controller module mounting 10 plug-in boards which contain all the logic.

This approach is completely at odds with the self-contained, compact packaging used by most programmable CRT terminals and is quite inconvenient for the user. Either he must buy a bulky pedestal mount, with the controller in the pedestal, or he must locate the controller on a table adjacent to the Visual Display Unit. Particularly if the user buys the printer as well, this configuration results in quite a large space utilization.

*Jennings is manager of advanced products for Pertec Corp.*

## 'The Plug' Compatible With IBM 3277 Display

NEW YORK – An information display terminal has been designed by Genesis One Computer Corp. to be plug-compatible with the IBM 3277 Model 2 display station.

Built to coexist with or to replace existing 3277 Model 2 terminals for data entry and retrieval applications, The Plug, or G77, can be connected directly to the IBM 3271 or 3277 Model 2 control unit, according to the firm.

Incorporating all standard 3277 Model 2 characteristics, the G77 also features a home key to return the cursor to the first character entry position, automatic variable initialization for bright dot display of variable data, a repeat key and a blinking cursor.

The company claimed that at $3,392, the price of the G77 is approximately 20% below comparable IBM units.

The terminal can also be leased from the firm at 300 E. 44th St., 10017, for $89/mo for two years, $77/mo for three years or $73/mo for four years.

# Trans-Canada 'Datapac' Net to Combine Digital, Packet Switched Transmission

By Ronald A. Frank
Of the CW Staff

OTTAWA, Ont. – The Computer Communications Group of the Trans-Canada Telephone System has announced that its intelligent packet switching network will be operational in mid-1976.

To be called Datapac, the network will combine the digital transmission capabilities of the existing Dataroute together with packet switching techniques.

Two services will be available on the network for a variety of users. The first, called Datapac 1000, will handle transaction-type communications involving short inquiries and responses such as those used with credit authorization and point-of-sale (POS) operations. The Datapac 1000 service will be designed for low-volume users.

A second service, called Datapac 1500, will be for high-volume users who will utilize a standard network protocol to transmit their data. It is expected that this service will be 10% to 50% less expensive than current systems, a spokesman estimated.

Datapac 1000 service will include asynchronous speeds of 300-, 600- and 1,200 bit/sec for terminal-to-node communications, and synchronous speeds of 2,400-, 4,800- and 9,600 bit/sec for node-to-host CPU communications. Transaction sizes up to 200 characters will be handled and the average busy hour response time is projected at "five to eight seconds."

Some typical applications for the Datapac 1000 service will be sales reports, management information, stock quotes and inventory control, and terminals to be initially supported by the service include the Amcat I from Addressograph-Multigraph and the DSC 1131 from Data Source Corp.

Although these are primarily POS terminals, they have function keys for other applications such as the maintenance of hospital patient records, the spokesman said.

### 'Snap' Format

Packets within the Datapac network will utilize a format called Standard Network Access Protocol (Snap) and exact specifications for this format will be announced at the end of this month, the spokesman said.

A Snap packet has framing bits at the beginning and end which tell the receiving station where the packet starts and where it stops. A second unit for communicating with the network contains the address where the packet is to be sent, link and end-to-end protocols and the class or priority of the message.

Each packet has cyclical redundancy check which will result in an error performance of less than one undetected error in every $10^{12}$ bits transmitted within the Datapac network, the spokesman said.

*(Continued on Page 25)*

## Get the Message?

A message traveling through the Datapac network would be handled in the following sequence: The originating terminal, say at a bank or retail store, sends its message to an interface processor (IP) at a Datapac network node.

The IP then places the data into network-sized packets. It interleaves several incoming data streams on one high-speed synchronous line and sends its packets to its local packet switcher. The local switcher checks the accuracy of the transmission with the IP and sends the information to the appropriate packet switcher along intercity Dataroute facilities.

All messages are kept in a buffer or storage area at each point until it has been established that the information has been received accurately at the next point.

In the receiving node, the packet switcher sends the packets to another interface processor which breaks the messages into their individual packets and ships them along the final leg.

The computer receives the message, processes it and, if necessary, generates a response which reverses the route back to the originating terminal.

# 'Datapac' Net to Combine Digital, Packet Techniques

*(Continued from Page 24)*

Intercity links will be high-speed digital circuits based on the existing Dataroute and the Network Control and Accounting Center, which will be established to oversee all aspects of network operations. It will diagnose trouble spots or potential trouble spots and take immediate action to rectify the situation, the spokesman noted.

Every element within the Datapac network will have a backup system on automatic standby ready to take over from the prime element. And the Datapac network will employ adaptive or dynamic routing to pick the best of a choice of routes for an individual packet, the spokesman said.

Four nodes in the Datapac network are scheduled to be in operation by mid-1976 including Calgary, Toronto, Ottawa and Montreal. By 1980 additional nodes will be operating in Vancouver, Edmonton, Regina, Winnipeg, Hamilton, London, Quebec City, Halifax, Saint John, St. John's and possibly other cities, the spokesman said.

The packet switching processors at each node will be programmable and they will have the capability to undertake a variety of functions such as error checking, speed conversion and adaptive routing. And the Datapac network will link "any number of users with any number of data bases or computers." Thus it will give each authorized user the possibility of wide access to many data bases.

### Usage Rates

Rates for the Datapac services will be primarily based on usage, with distance described as "a secondary factor." Usage charges will be based on a "Kpacket" basis with each packet containing 32 characters. There will be additional charges for mileage from points outside the Datapac serving exchanges.

Datapac 1000 will have a monthly access charge depending on the data bases that can be accessed from a terminal. In general, the charge will decrease as the number of data bases increase, the spokesman explained. There will also be a charge of $50/mo for each line connected at a data base.

A typical usage charge for a link between Ottawa and Montreal would be $1.25/Kpacket for service between a terminal and data base under proposed rates for Datapac 1000. A similar link under the Datapac 1500 service would cost 70 cent/Kpacket with a minimum requirement of 75 originating Kpacket/mo for each line. All proposed rates would be subject to regulatory approvals.

## Multipoint 'Hilo' Users Get Free Audit Service

ANN ARBOR, Mich. – DMW Telecommunications Corp. has announced a no-charge audit service to verify billing routines for users of multipoint circuits priced under ATT's high density/low density tariff. DMW performs the verification using a recently completed functional enhancement to DMW's Hilo-74 network pricing and optimization program which produces minimum cost line routings for multipoint circuits.

### Mail It In

Users may submit up to five multipoint circuits for verification at no charge; audits of more than five circuits will be made by DMW for a nominal fee which depends on the size of the network. Interested users may obtain this audit service by mailing their AT&T-stipulated routings for the circuits directly to the company.

Users who provide V and H coordinates and homing point rate centers with their service requests will generally receive the verified billing routings within 10 business days after receipt of the necessary input data.

The multipoint optimization feature will become available in the Hilo-74 package on purchase or lease basis in the near future, the company said. DMW is at 2975 Hickory Lane, 48104.

# Fast Graphics.

# For fast thinkers.

**Solutions are fast and efficient with Tektronix' 4014 Family of Graphic Terminals.**

The best solutions for leaders in medicine, research, business, math, science and energy-related fields. The best for taking the most data and making it the most workable information. Instantly. Profitably.

In seconds, our 4014 flashes your data on the screen. In the form of high resolution graphs, plots, maps, models, line drawings. Whatever you can visualize being visualized. Whatever you need to work with.

And since cost efficiency is also part of your job, our Graphic Terminals, although the best in the computer products industry, are also the best priced. Terminals from $4195 to $10,395.

Our CRT direct view storage screen displays clear graphics and alphanumerics in standard ASCII or APL. With 19" of picture. And the terminal plugs right into most computers and minis. With software support you just can't get elsewhere. Our Graphic Tablets from $2995 give you fast, freehand digitizing. Flexible Disc Memory from $3695 cuts mainframe and CPU time. And our 4610 Hard Copy Unit at $4295 provides a high resolution dry copy. So you get the picture both ways.

But there's still more to Fast Graphics than meets the eye. And since our Tektronix network is both local and worldwide, your area Applications Engineer is as fast as a phone call away. Or, write us for some fast information on the efficiency of Graphics in your area.

Tektronix, Inc.
Information Display Division
P. O. Box 500
Beaverton, Oregon 97077

TEKTRONIX®

Name

Company

Professional Discipline

Address

City State Zip

Phone

My Computer is

Does your computer accept graphics ☐ Yes ☐ N

My application is

I want an Applications Engineer to call ☐ Yes ☐ N

- ☐ Please send me the 1974 Catalog.
- ☐ Please send me the Graphics Handbook.
- ☐ Please send me the Flexible Disc Drive data sheet.
- ☐ Please send me the Graphic Tablet data sheet.
- ☐ Please send me the 4014 19" Terminal brochure.

## Bits & Pieces

### Disk Inspector Checks IBM 3336-11-Type Packs

BURLINGTON, Mass. – A Disk Pack Inspector with expanded capability to accommodate IBM 3336-11-type packs is available from Computer-Link Corp.

The 600 Series of inspectors includes Model 650 for 2316 and 1316 packs (11 and 6 high respectively) and Model 660 for 3336 and 3336 Model 11-type packs.

The inspectors permit the checking of packs for dirt and surface scratches so they can be corrected by cleaning or removed from service before serious damage is caused by head crashes and attendant chain reactions of damaged packs, data loss and rerun.

The Model 650 is priced at $1,450 and the Model 660 at $1,995. Computer-Link is at 14 Cambridge St., 01803.

### Voltage Regulator Handles 750 kVA in DP Centers

MENTOR, Ohio – A 750 kVA line voltage regulator from Cyberex can be installed either on the wall or as a free-standing floor model. The unit can be specified with: 5% harmonic filtering, spike eater transient suppression for over-voltage, step-down and isolation transformers and meters for input and output values.

The regulators are solid state and provide output voltages from 120 to 600 V ±0.5%.

A 750 kVA regulator is priced between $35,000 and $50,000 from the firm at 7171 Industrial Park Blvd., 44060.

### Litton Electrostatic Printer Available in Four Column Sizes

NEW YORK – The Datalog Model MC-5000 printer from Litton Industries is said to operate from any digital source as a teleprinter and/or printer plotter.

Priced in the $6,000 to $7,000 range, standard models of the MC-5000 print at speeds up to 800 line/min.

The printer uses a 7 by 9 dot matrix for character formation, with the paper being moved 14 discrete steps to form each line of characters. Proper paper drive is "assured under a variety of adverse operating conditions," the firm said.

MC-5000 printing speeds will be available either for synchronous or asynchronous operation. Utilizing fan-fold or roll paper supply, the unit prints on various dry electrosensitive papers.

Character set is 128-character Ascii, but any code will be available on request, the company added.

Standard models come in 20-, 40-, 80- or 132-column configurations.

The company is at 850 Third Ave., 10022.

## Budget-Bound User's Solution

# 360/30 Gets New Life With Accelerator

By Patrick Ward
Of the CW Staff

BAYSIDE, N.Y. – What does a college data processing department do with its ambitious plans when it can't get the money to replace its purchased IBM 360/30 with a bigger machine?

One answer is to make the 30 bigger and faster and use a lot of imagination in configuring it. The Queensborough Community College branch of the City University of New York (CUNY) took this approach and came up with a unique system that, while still computer-bound, can handle the batch and on-line applications the college wanted.

The 16,500-student college bought the 360/30 about six years ago as a 32K machine, said Alan W. Mason, manager of operations. Successive installations of IBM memory brought it up to 96K, the limit IBM puts on a 30's memory.

The DP staff then began looking for a 370, but New York City's policy is to purchase machines, and the college lacked the money for a new one, recalled Dr. George Goulandris, director of data processing.

"Core and speed of the CPU were the two bottlenecks we had in the 360/30," Goulandris said. "From there on it was just a simple conclusion to see . . . what we could do about expanding the core, or . . . [speeding] up the CPU, or both, which was exactly what we did."

#### Accelerators and Add-Ons

The college decided to enhance its 30 with both add-on memory and an accelerator device after deciding add-on memory alone would not solve the problem, Goulandris said.

Computer Hardware Consultants & Services (CHCS) of Newtown, Pa., was selected to provide an additional 96K and an accelerator. The company was the only one of the potential vendors that would make use of the 96K of IBM core, Mason said. Other companies wanted to strip the machine down to 64K before installing their own memory.

However, the college insisted on use of the full 96K, since it owed IBM $32,000 for the last 32K on a five-year plan and IBM did not want the memory back, Mason said.

CHCS installed the enhancement hardware over a weekend. The company put an additional gate into the computer, plus the accelerator and its power supply. The extra 96K is in a separate core box attached to the CPU.

The college paid $42,000 for the additional memory, accelerator, installation and warranty, Goulandris mentioned.

The college had also required that the enhancement would not force extensive reprogramming. A systems programmer had to spend only half a day changing the supervisor to allow for more core, Mason noted.

"The first week was perfect," Mason remembered. "In the case of really CPU-bound jobs, there was a 30% to 40% speed improvement the first day, which was really fantastic."

#### Honeymoon Over

Then hardware problems took the system down. It stayed down 70% of the time for the next three weeks, he said.

*(Continued on Page 32)*

# Add-On Memory Modules Offered For 360/20 Users by Econocom

MEMPHIS, Tenn. – The Econ-20 memory modules now available from Econocom, Inc. complete the range of add-on memory for the IBM 360 family by providing extensions to the 360/20 as it comes from IBM.

Only submodels 1, 2, 3 and 4 of the Model 20 can utilize the additional core boxes. With them, main memories can be extended from IBM's maximum of 16K bytes up to a new high of 48K, in 8K-byte increments.

Econ-20 modules were developed and are being built for Econocom by Standard Memories, Inc. of Ft. Lauderdale, Fla., a company already marketing add-on memories for several of the larger 360 models.

The extensions for the 20 are said to operate at the same speeds as original IBM memories and to be transparent to the user except that the enhanced machine can hold larger programs.

To cope with addresses higher than the 360/20's original upper limit, Econocom had to make some slight changes in IBM's disk-processing system (DPS) control software. Otherwise, software and the diagnostics available to the user are unchanged, the vendor said.

IBM has accepted "in principle" both the new memory modules and the DPS modifications, Econocom spokesman claimed, admitting, however, that the mainframer has not yet given its blessing – and agreement to maintain modified 20s – in formal terms.

The new memory extensions, scheduled for first delivery in the first quarter of 1975, will be housed in 7-in. wide cabinets that attach to the side of the user's CPU.

Econ-20 is available in four configurations, from 8K to 32K bytes in 8K blocks, ranging in purchase price from $12,975 to $24,975. The same configurations are available under lease, with a 24-month minimum, for $475/mo to $1,045/mo.

Sorbus, Inc. has the national maintenance contract for all Standard Memories add-ons including Econ-20. Users can sign up for this service for a cost of $40/mo depending on the configuration, Econocom said from 855 Bridge Lake Blvd., P.O. Box 171116, 38117.

## 200 Nsec Slower

# Nova 830 Cuts 840 Price by 33%

SOUTHBORO, Mass. – The Data General Corp. Nova 830 minicomputer sacrifices a little memory speed but little else to give its users a 33% lower purchase price than the Nova 840.

The 830 uses 32K byte, 1,000 nsec core memory units to make possible a system of large size and capability at lower prices, according to the vendor. The 840 memory speed is 800 nsec.

A Nova 830 processor with 128K bytes of main memory, memory management option, power supply and console panel in a 10-1/2-in. chassis with 10 additional slots available for system memory and I/O interfaces costs $23,150. An expansion chassis for additional interfaces is available.

An equivalent 840 costs $35,730, the company said.

The Nova 830 has the same facilities as the faster Nova 840: full hardware-protected dual operations, standard dual processor/shared disk operations, memory mapping with 2K-byte boundaries and support of a full 256K bytes of memory in one processor, it added.

Options available with the Nova 830 include a high-speed single/double precision floating point processor, communications adapters and process input/output devices.

The Nova 830 supports Data General's operating systems, high level languages, utility programs and program development aids.

For critical applications requiring high system availability, the Nova 830 can be configured into a dual-processor/shared disk system with a second Nova 830 or any other Data General computer, the company said.

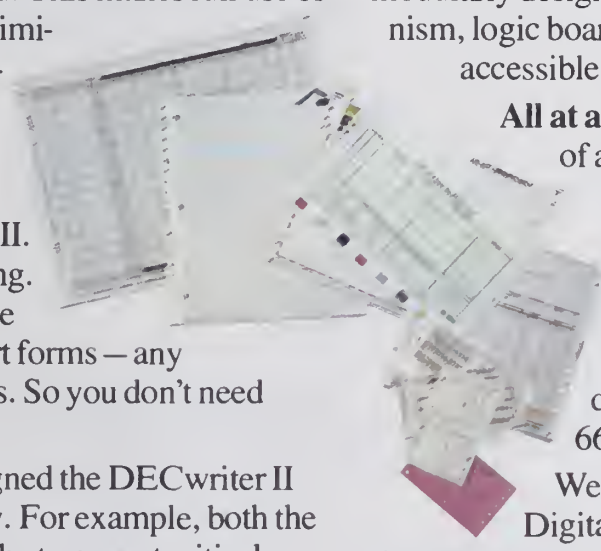
# We designed the new DECwriter II for speed and reliability.

# And we priced it to sell. $1250 in quantities of a hundred.

The DECwriter II gives you performance no one can touch at the price.

**It's fast.** A true 30 characters per second, including carriage return and line feed. This makes full use of standard phone lines and eliminates the need for software-generated fill characters.

**It's versatile.** You can use your standard line-printer forms with the DECwriter II. You get 132-column printing. And the reliable tractor-type paper feed takes up to 6-part forms — any width from 3 to 14⅞ inches. So you don't need special forms.



**And it's reliable.** We designed the DECwriter II using proven concepts only. For example, both the printhead and keyboard — the two most critical elements — are field-proven designs, already in use at Digital customer installations. We build the DECwriter II to last; it'll give years of service with minimum maintenance.

**You get highly legible printout.** A full 96 printable characters, upper and lower case. Each character is printed on a 7 x 7 dot matrix. Legibility, as well as reliability, is ensured by a servo-system to control carriage motion and by a stepper-motor-controlled paper feed to produce accurate line spacing.

**And easy interfacing.** A 20mA Teletype interface is standard, EIA is also available.

**And trouble-free maintenance.** The LA36 is modularly designed. Printhead, keyboard, mechanism, logic board, and power board are all readily accessible for easy replacement.

**All at a very low price.** $1250 in quantities of a hundred. Can you afford not to find out more?

**Call us.** Dial 800-225-9480. Toll-free from 8:30 AM to 5:30 PM Eastern time. (US only. Massachusetts residents, please dial (617) 481-7400, extension 6653.)

We're the Components Group of Digital Equipment Corporation, One Iron Way, Marlborough, Massachusetts 01752.

In Canada: Digital Equipment of Canada Limited, P.O. Box 11500, Ottawa, Ontario, K2H8K8. (613) 592-5111, extension 127.

In Europe: 81 Route de l'Aire, 1211 Geneva 26, Telephone: 42 79 50.

digital
COMPONENTS GROUP

**Unbundling the world's most popular minicomputer systems.**

# Miniworld

## Multiline Interface Designed for PDP-11

PENNSAUKEN, N.J. – Infotron Systems Corp. has introduced a multiline processor interface for Digital Equipment Corp. PDP-11 minicomputers.

The PI510 is said to be functionally equivalent to DEC's own interface, the DH-11, and is software-compatible with the PDP-11. However it offers features that permit quick diagnosis of system malfunction and also simplifies maintenance, Infotron said.

The P1510 displays communications activity visually through LEDs on each channel adapter and central logic circuit module. Nine separate functions are monitored by the LED indicators and an audio alarm warns the operator of a central logic malfunction, Infotron added.

The P1510 can handle up to 16 channels and can transmit and receive a mix of 14 data rates from 0- to 9,600 bit/sec. Diagnostic test tapes are supplied with the system.

A typical system is priced at $10,000 from the firm at 7300 N. Crescent Blvd., 08110.

## Orbis Diskette Drive Interfaced to PDP-11

COSTA MESA, Calif. – Orbis Systems, Inc. has interfaced its Model 74 diskette drives to Digital Equipment Corp. PDP-11 minicomputers.

The controller seeks on all drives independently and the seeks can occur while reading on one drive. Average record transfer rate for a four-drive system with randomly located records is 11 record/sec.

In addition to the IBM standard 26 sector/track (128 bytes each), the controller will initialize diskettes into 15-, eight-, four-, two or one sector/track.

Sector search, correction of track position for initialized bad tracks and CRC generation and check are accomplished by hardware. Hardware generates all gaps, sync bytes, preambles, CRC bytes and postambles, the firm said.

Software packages for the controller include an initialization program, diagnostic program and driver. The controller is priced at $3,000 from the firm at 3303 Harbor Blvd., Building K4, 92626.

# System/7 Operator's Console Bypasses Regular Channel

ANN ARBOR, Mich. – The Interautomation, Inc. Model 2501 operator's console is said to make more efficient use of the IBM System/7.

With the Model 2501, full utilization of System/7 capabilities is possible through an increased level of communication between the operator and the computer, the company said.

The 2501 connects to the computer digitally, permitting an increase in the level of communication without using any of the System/7's regular communication channel, the company added.

Interautomation Model 2501 Operator's Console

### Eight Consoles Allowed

The Model 2501 can be added to existing System/7 installations or it can be included in the design of new systems. A multichannel serial interface is available which, because of the small number of digital inputs and outputs required by the 2501, allows up to eight consoles to be incorporated with each System/7, the firm said. The consoles can be remotely located up to 2,000 feet from the computer.

A complete software and hardware interface package is said to enhance the operation of the System/7 in applications such as process control, production monitoring systems, laboratory operations, operator process communications, production test systems and metal working monitor systems.

The human engineered 2501 console houses a full alphanumeric keyboard, CRT display and lighted push-button function switches and indicators. In addition, an auxiliary line printer is available for use where a hard-copy printout of the CRT display is required.

Interautomation has priced the console at $12,500. The firm is at Plymouth Building, 2929 Plymouth Road, 48105.

## Larger Data Tablets Added To Cybergraphic Series

SCOTTSDALE, Ariz. – Two larger data tablets, 14 in. by 14 in. and 22 in. by 22 in., are now available in the Talos Cybergraphic Series.

Both tablets have 100 line/in. resolution and ±.010 in. accuracy, repeatability and linearity; 200 line/in. models are also available, the company said.

Talos' closed loop, all electronic writing servo is said to assure long-term stability and accuracy. The tablets are low profile, flat and have a rugged formica surface, and the system is not affected by the environment or stray magnetic fields, the firm said. Units are permanently calibrated and never need realignment.

A 14-in. system is priced at $2,495; a 22-in. system at $2,750. Interfaces are an additional $350. Talos Systems is at 7311 E. Evans Road, 85260.

# Accelerator Injects New Life Into Budget-Bound 360/30

*(Continued from Page 27)*

IBM maintenance of the mainframe had ended when the CHCS modifications began. The people from Comma Corp., who were now doing maintenance, did not seem that familiar with the equipment, Mason said.

A CHCS engineer flew up from Philadelphia and resolved the hardware problems after the site had been down for a 48-hour stretch, he continued. The engineer has since had some training sessions with the Comma people, and the college now keeps spare parts on hand.

The maintenance situation is now proceeding smoothly, Mason said. IBM and the other vendors continue to service the peripherals.

The hardware enhancements continue to bring a 30% to 40% throughput gain on the disk handling and core jobs where there is a lot of storage involved and a lot of calculations, Mason said.

The hardware modifications have also improved on-line response times, bringing them into the four to five second range, he added.

Batch processing throughput gains depend on the I/O involved, Mason noted, since a relatively slow printer can mask the mainframe's faster processing.

The lack of core before the changeover had also hampered the college's plan to go to an on-line retrieval and update system, Mason added.

Since it could not afford a larger mainframe, the college leased an IBM System/7 processor a year and a half ago to act as a front end to the 360. Lack of core impeded use of a 2703-type communications controller, Mason said, because it would have left too much of the communications handling in the mainframe.

The college DP staff programmed the System/7 with a home-grown package based on previous IBM work for a New York Hospital. The System/7 handles all I/O and the fixed format screens for 12 Hazeltine 2000 CRTs and also does some editing, he noted.

The System/7 software was written in P-code, a modified BAL. Application programs on the 360/30 are in Cobol.

### More Functions On-Line

Although the on-line system was up in January, it was only when the extra core was installed in July that the college could add on-line updating to the registrar's office without dedicating the computer to that task, Mason observed.

The college has also added on-line student record inquiry in the bursar's office, Goulandris mentioned. Updates are batched on disk and processed nightly. An IBM 3881 mark sense device reads results from the student testing office, does grading and even reads the data from instructor evaluation forms the students hand in.

The DP staff is working on automating the dean of faculty's office and already has a complete, on-line faculty base, Mason said.

And Goulandris added that within a year he hopes to see the college business office staff entering data on CRTs and producing hard-copy purchase orders in one operation.

There are also plans to replace the current batch update method with an on-line registration system within the next six months, Mason continued.

The staff is considering both Hewlett-Packard and Documation mark sense card readers, he said. The mark sense device will read student registration cards and transfer the information to a CRT screen, where an operator will sight verify the data and transmit it to the System/7. The CPU will check the forms for course conflicts, pre- and corequisites and other eligibility factors.

The college then plans to have Memorex 1240 printers produce the students' bills, which will be paid at NCR point-of-sale terminals linked to the System/7, which will then note the student's payment on the 360/30's Isam student data base.

"Right now the problem is that the 360/30 is still slower than everything else we have," he remarked. The shop has nine 2314 disk drives and three 2314-equivalents from Memorex. There are also three IBM 3420 tape drives.

The college also has the faster 1403 N1 printer, a 3211 printer and 2501 2540 card readers.

An IBM 3704 communications control unit in the shop is currently being used as a remote job entry terminal to dual IBM 370/168s at the Board of Education.

Even though the accelerator had sped things up considerably, Mason said the shop is degrading performance now by running one on-line and two batch partitions instead of the one used previously.

## Plotter Users Plot Happy Course

DELRAN, N.J. – While the hoopla that surrounded the entrance of digital plotters has diminished over the last several years, a quiet revolution has taken place as increasing numbers of users have installed plotters for the production of graphic representations of business information, according to Datapro Research Corp.

In a recent survey of plotter users, Datapro found users generally satisfied with the overall performance and accuracy of their equipment, but a number of users "expressed serious reservations" about the speed of plotting and about the associated software and technical support.

Usable responses to the survey were received from 93 users with a total of 112 digital plotters installed. Their usage of the three basic types of plotters was: drum, 78%; flatbed, 18%; electrostatic, 4%.

With respect to configuration, 38% of the plotters were on-line to local computer systems, 10% were used as time-sharing terminals and 52% were off-line, according to the survey.

The principal plotter applications reported by the respondents were: graphs and bar charts, 84%; drafting, 82%; interactive design, 15%; and other applications, 22%. (The total exceeds 100% because many users indicated multiple applications.)

The survey is part of a report, "All About Digital Plotters," priced at $10 from the firm at 1805 Underwood Blvd., 08075.

The ratings from the survey indicated the users of flatbed plotters were better satisfied, on the whole, than the users of drum-type or electrostatic plotters.

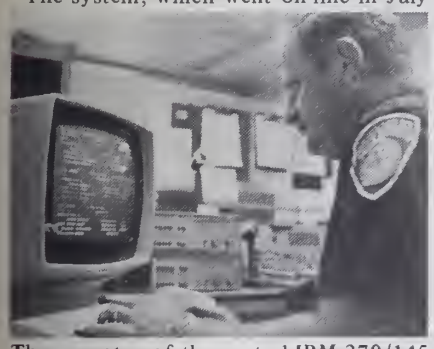
One noticeable complaint voiced by slightly over 10% of the respondents dealt with the problems and manipulations required when using pens and liquid ink systems.

## Transmits Crime, Vehicle Data

# Around-the-Clock System Aids Police

ROCHESTER, N.Y. – The police department here is proving that "crime doesn't pay" with the help of a DP system which aids in quick relay of information.

The system, which went on-line in July 1973, links 10 CRT terminals and two keyboard terminals to an IBM 370/145 and provides Monroe County policemen with important criminal and vehicle data files stored in the computer.



The operator of the central IBM 370/145 responds to a system request for data initiating daily docket preparation.

Generating detailed statistical records of crimes, arrests, accidents and calls for service, besides listing the court docket and retrieving of criminal warrants and histories, are all part of the service handled by the computer.

The network has distributed terminals throughout the county to help police with any questions that might arise.

Although it is now on a county level, the police department would like the system to interface directly with state and federal data bases, according to Richard Gana, director of information services for the department.

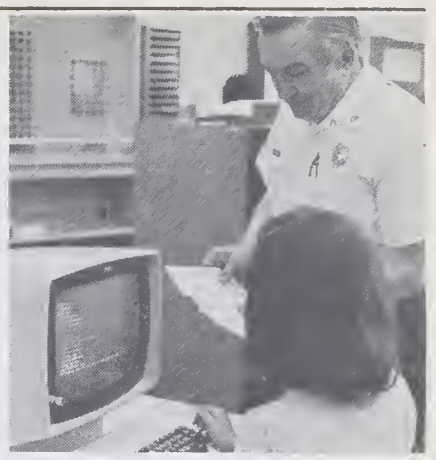
The instant, around-the-clock access to the data system is both secure and simple. It consists of "signing on" to identify the operator and a few keystrokes to obtain the desired information.

If a policeman wants to see one of Monroe Counties' 500,000 auto registration records, the license plate number or owner's name is keyed into the computer and the name, address, sex, race and date of birth, of the owner, as well as the vehicle year, make and identification number, appear. The readout also indicates whether the vehicle or plates are stolen.

The stolen vehicle/plate files are updated on-line via two 2740 terminals, making the information immediately available on all network terminals.

A "hot sheet" of stolen vehicles is updated every 30 days by the 2740s.

Warrant and criminal history files are accessed directly by name or by alias, Gana said.



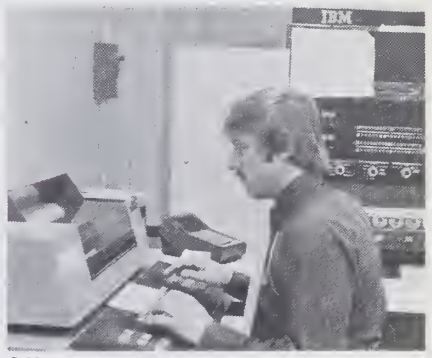
Sgt. Anthony Chiappone discusses entry of police calls for service with a data entry operator in the records section.

Warrant status updates are made on-line, while an off-line warrant analysis program, which generates served and cancelled warrant records daily, is mailed to all towns in the county.

The criminal history file is generated and updated from current arrest reports. Previous arrest histories can be keyed in either by name or alias and if necessary narrowed down by additional specific information.

Four police terminals are devoted to on-line entry statistics on crime, accidents and calls for service. The information, taken from general, accident and stolen vehicle reports, serves as input for internal reports as well as reports for such external agencies as the FBI, the New York State Department of Correction and the National Safety Council.

The system has proven successful and, according to Gana, has increased the potential for crime prevention. Plans are being made to broaden the tasks and operations of the system.



Officer Ronald Barker at Rochester Police Department's dispatch center retrieves warrant information on visual display terminal during a license check procedure requested by a patrol unit.



## DP Case Histories Detailed by UK Book

MANCHESTER, England – In an effort to fill the vacuum of practical material available to illustrate the basic principles of investing in and applying computer systems, NCC Publications here has published a textbook entitled "Data Processing Case Histories."

The 10 cases demonstrate the decision-making process at all levels, ranging from the initial investment in a computer system to a design philosophy for the individual system.

The studies fall into three categories – "A Question of Direction," which concentrates on the big decisions, "Over the Credibility Hurdle," concerning the usefulness of DP itself, and "More Than One Way Home," about design and implementation problems.

Each case is prefaced by a list of terms used and followed by suggested discussion points and a summary of the lessons to be learned.

NCC Publications suggest the book for university and polytechnic courses in DP, computer science and business.

Edited by G. Penney, the text is available from NCC Publications, David and Charles Holdings Ltd., S. Devon House Railway Station, Newton Abbot, Devon for 3 UK pounds (about $7.20).

# COM TO THE POINT: MEMOREX AT $1,255 A MONTH.

The reason why 90 percent of all on-line COM systems in the world are Memorex Systems is simple: a complete Memorex COM system (excluding viewer) costs only $1,255 a month—less than one-half the price of competitive systems.

That's the first reason why independent EDP managers use Memorex COM. But the savings don't stop there. Because Memorex LED/fiber optics technology is the most advanced in the field, your maintenance costs with a Memorex COM system are less than one-half your maintenance costs with competing systems.

Easy to operate with its prepackaged film, a Memorex on-line COM system appears as a 2821/1403 printer combination to your IBM 360/370. That means no software changes when you attach a Memorex 1600 COM system to your computer.

And once it's attached, you'll see why Memorex COM is making line printers obsolete.

Up to 10,000 lines a minute gives you a speed ten times faster than a line printer. At one manufacturing company, this increased speed saved an extra 80 hours a month of computer time for data processing.

Memorex COM not only saves you paper costs—one public utility saves more than 50 tons of paper a month by using Memorex COM—but it saves you about 98 percent of the storage space required by paper.

So, when you install COM, Count On Memorex for the highest performance at the lowest cost. Memorex supports you, the EDP manager, with its complete line of COM products and supplies and its worldwide sales and service organization. Write for a free COM information kit today. Memorex Corporation, San Tomas at Central Expressway, Santa Clara, California 95052.


MEMOREX

**Count On Memorex**

# Bug-Counting System Still Needs Debugging

LAS CRUCES, N.M. – After two years of trial operation, researchers at New Mexico State University are still working to get the bugs out of a bug-counting computer.

The insect identification and counting system, developed to monitor the pest population in cotton fields with an eye toward reducing the use of pesticides, is now about 85% to 95% accurate.

And 100% accuracy is not far off, predicted J.W. Atmar, one of the project's developers. Two problems still have to be solved.

### Handling the Bugs

The first involves the actual handling of the insects. Each bug is now placed by hand on cards which are scanned by the computer, a time-consuming process.

Placement of the bugs on the cards is the second problem. Atmar observed that the bugs must be kept from touching each other so that the computer won't read a group of bugs as one big bug.

"All human intervention has to be reduced to as little as possible," Atmar said, noting the researchers are working on "a mechanical placement machine – an insect separator – because it's so much work to put the bugs down by hand."

When perfected, the computer will allow mass counting and classification of up to 5,000 insects at one time and provide rapid population estimates on a day-to-day basis, allowing cotton producers to apply pesticides only when needed.

### Giant Bugcatcher

At present, pesticide applications can vary from none at all to as many as eight per season due to the sporadic nature of damaging insect populations. An estimated one-fourth of these are made as a result of seeing neighbors treating their fields.

Researchers collect the insects for the study with a giant bugcatcher mounted on a high clearance tractor that blows 70 miles-per-hour winds across cotton fields, automatically gathering up the dislodged insects.

These field samples are then placed in an instrument consisting of a scanning microscope photometer and a computer. The computer identifies the insects on the basis of pattern recognition by reading the color, size and shape. So far, the computer has been programmed to read a dozen different types of bugs.

## *Going to the Dogs...*

WESTLAND, Mich. – This city of 100,000 has found another job for its small computer: assistant dog catcher.

The IBM System/3 Model 10 contains license numbers for all registered dogs and includes a description of each dog and its owner. Consequently, the process of locating a dog has been speeded up, an advantage in cases where a child has been bitten and proper treatment must be given quickly.


# An investment in the future.

It took foresight to put the development and perfection of a product like Omega 80 ahead of costs.

Because in the long run, costs are always nominal when a product meets a growing need. That's the case with Omega 80. It's designed for high-speed, high-density digital recording.

Its recording/reproduction range is from 25,000 FRPI to as high as 80,000 FRPI.

The materials and technology used to produce this new medium are so advanced, it will be years before Omega 80's potential is even challenged.

But with a life expectancy of up to 100 years, an investment in Omega 80 is a solid investment in the future.

Omega 80. $30 per reel.

GRAHAM MAGNETICS
Graham, Texas 76046

## Monthly Costs Down 61%

# Replacement for T/S a Feather in Bank's 'CAP'

SAN FRANCISCO – A computer dedicated to the complexities of corporate customer relationships keeps Wells Fargo Bank loan officers here continuously appraised of the profitability of corporate accounts while enabling the bank's customers to make optimum use of various combinations of loans, deposits and other services.

The computer, a 128K Hewlett-Packard HP 3000, was installed last May to overcome report lead time and cost problems encountered with a time-sharing service.

As a result, Wells Fargo operations officer Sheila Dummer, who supervised the installation, said, "Our reports are now timely instead of three to four months overdue, and our computer costs 61% less than former time-sharing fees." Wells Fargo's computer rents for $5,000/mo compared with $13,000 previously spent monthly for time-sharing.

Its multiprogramming feature allows concurrent running of batch-oriented and time-sharing applications. Thus, while the system here generates a monthly customer account report on a batch mode, a bank officer in Los Angeles may inquire in a time-sharing mode the effect contemplated changes in a compensating balance or advance in loan funds will have on the account's projected profit return.

The bank's successful switch of its Corporate Account Profitability (CAP) system to the HP 3000 has resulted in a 50% increase in corporate account work load with nine other reports added within three months after installation.

The basic objective of the CAP system is to monitor the profitability of individual corporate accounts to the bank while offering the customer the best of many options from his vantage point for a variety of bank services.

Inputs to the former time-sharing system were exclusively punched card, read into a 2780 emulator and communicated via long-distance phone lines to the service bureau.

Now only 29% of the input is manually keypunched. Almost 65% rides free as a by-product of the bank's centralized IBM 370 (an output tape is compatible with the HP 3000), and almost 6% is entered by loan offices through terminals located here in Palo Alto and in Los Angeles.

Two video display terminals now being installed will reduce the keypunching load further to 9%.

Reports generated by CAP on a monthly basis include an analysis of loan, deposit and service activity by customer, loan officer, geographic area and division. Among the computations shown on the report is a total relationship indicator which summarizes the total profitability of the relationship.

Quarterly the monthly analysis and activity report is issued on a moving average basis to smooth out cyclical effects.

Wells Fargo Bank's Sheila Dummer, assistant operations officer, and Michael Park, corporate banking officer, observe a CAP printout from the bank's HP 3000 computer.

## Citizens With Gripes Get Help From System

LOUISVILLE, Ky. – Irate citizens here are finding they no longer have to wait months before city officials come to grips with their gripes. Every call to Action Line, the city's complaint center, is now being stored in a computer to speed up the response process.

Before the computerized process became operational last month, complaints received at the center were filed by hand with the intention of following them up 10 days after they had been forwarded to city departments for action.

But it just didn't work. A recent inventory yielded 232 unsettled complaints in one city department, 70 in another.

Now the system prints a weekly list of all unresolved complaints more than 10 days old and the list is forwarded to the appropriate department. It also gives a reading of problem spots by location and type and generates a report for the mayor and board of aldermen broken down by department and aldermanic ward.

City officials claim Louisville is one of the first cities to use such a system and that there has already been a substantial decrease in backlogged complaints.

## Potential Abusers Spotted

HARRISBURG, Pa. – Attempts to determine persons most susceptible to drug or alcohol abuse have been spurred on by a $296,000 National Institute of Drug Abuse grant made to the Governor's Council on Drug and Alcohol Abuse here.

The grant is being used to gather statewide information on abusers by unsigned questionnaires which are fed into a computer for data compilation.

Summaries of questionnaire results for each county and the entire state are mailed to all county agencies. The summaries provide a general profile of the drug or alcohol abuser which can then be used to spot and help potential abusers.

# Society Sundries

## Compcon '75 Names Program Chairman

SILVER SPRING, Md. – Terry Opdendyk, manager of software development at Itel Corp., and Dr. Wendell Sander, manager of the memory research department at Fairchild R&D, have been appointed program chairmen for the 10th IEEE Computer Society conference, Compcon '75 Spring.

The conference theme is "Computer Technology to Reach the People." Opdendyk is responsible for the software portion of the program and Sander will specialize in hardware.

Lowell D. Amdahl, general chairman of the conference, will supervise the applications section.

Compcon '75 Spring will be held Feb. 25-27 in San Francisco. Further information may be obtained from Advance Program, Compcon '75 Spring, P.O. Box 639-P, 20901.

## Irish, British Societies Discuss Growth in Data

GALWAY, Ireland – Problems arising from the explosive growth in data faced by computing installations was the main issue at the fifth annual conference of the Irish and British Computer Societies held here last month.

Papers were given on such topics as complex data relationships, data communications, the development of computing in Europe and data versus information. The final session was an open forum on privacy and security.

More than 90 delegates from both North and South Ireland attended the conference.

Information on the proceedings can be obtained from Terence Carville, Infoplan Ltd., 20 Eastbourne Terrace, London, England W2 6LN.

## IEEE Picks Standards Head

SILVER SPRING, Md. – The Institute of Electrical and Electronics Engineers (IEEE) has named Dr. Tse-yun Feng, a faculty member of Syracuse University, as chairman of its Computer Standards Committee. He will be responsible for studying the need for new or revised standards and will represent the society in cooperating with standardizing bodies outside the IEEE.

Feng is presently a Distinguished Visitor of the Computer Society. He has served as session chairman or panelist at several conferences and initiated the Sagamore Computer Conference on Parallel Processing.

At Syracuse University, he teaches in the Department of Electrical and Computer Engineering and specializes in the areas of computer architecture, associative/parallel processing, switching theory and logic design.

## TI Mini Users Incorporate

HOUSTON – Texas Instruments Minicomputer Information Exchange (TI-MIX), a minicomputer user group, was recently incorporated as a nonprofit organization.

TI-MIX was organized in October 1973 to facilitate the exchange of information between minicomputer users. There are now over 1,000 members on record, with no dues or fees charged for membership.

Services provided by the group include programs for a software library, a publication for members every two weeks and an annual symposium. Regional meetings are held at 13 locations in the U.S.

Further information is available from Floyd Burton, TI-MIX Director, or Pat Roddy, TI-MIX Coordinator, P.O. Box 1444, M/S 784, 77001.

## Future NCC Sites Chosen

MONTVALE, N.J. – New York and Dallas have been chosen as the future sites for the 1976 and 1977 National Computer Conferences (NCC) by the NCC Board.

In 1976, NCC will be held at the New York Coliseum, the site of the '73 conference, during the week of June 7-10. The 1977 conference will be at the Dallas Convention Center June 13-16.

This year, NCC will take place in Anaheim, Calif., May 19-22.

# Calendar

Dec. 2-3, Boston – National Microprocessor Conference sponsored by Arthur D. Little, Inc. Contact: Marjorie Maws, Arthur D. Little, Acorn Park, Cambridge, Mass. 02140.

Dec. 3-4, Washington, D.C. – Sixth National Transportation Forum and Exhibition, with the theme "Electronic Systems Serve Transportation." Contact: Transportation Data Coordinating Committee, 1101 17th St., N.W., 20036.

Dec. 3-6, San Francisco – 20th Annual Conference on Magnetism and Magnetic Materials. Contact: Conference Steering Committee, c/o I.S. Jacobs, General Electric R&D Center, P.O. Box 8, Schenectady, N.Y. 12301.

Dec. 5-6, San Francisco – Annual Joint Conference of the California Educational Data Processing Association and the California Educational Computer Consortium. Contact: Dr. James S. Lucas, Santa Clara Unified School District, P.O. Box 397, Santa Clara, Calif. 95052.

Dec. 9-11, Washington, D.C. – 1975 College and University Systems Exchange (Cause) National Conference. Contact: Cause, 737-29th St., Boulder, Colo. 80303.

# COMPUTER INDUSTRY

## CI Notes

### Honeywell Bull Denies Talk of Merger With CII

PARIS – Honeywell Bull has denied reports of efforts to merge it with Compagnie Internationale pour l'Informatique (CII).

The move, reportedly under consideration by the French government, would bring Honeywell Bull into the Unidata complex through its affiliation with member CII. Siemens and N.V. Philips are also members of Unidata, which was founded to compete with IBM in the European computer market.

Honeywell Bull said it has not received any proposals from CII or the French government. Honeywell Bull is 66% owned by an international unit of Honeywell, Inc. in which GE also has a small interest.

The remainder is owned by Compagnie des Machines Bull of France. CII receives direct and indirect French government assistance.

### DCC to Supply Redifon

FAIRFIELD, N.J. – Digital Computer Controls, Inc. has received an order for 500 D-116 minicomputers from Redifon Electronic Systems Ltd. Delivery will take place over a two-year period. Redifon makes a key-to-disk system.

### Interdata Launches Vertical Effort

OCEANPORT, N.J. – Interdata, Inc. has established a Market Development Group to identify key vertical industries and special applications areas for which it will help develop hardware and software tools tailored to each area.

"Early targets for the group will be the electric utility industry and data communications applications," said Ronald A. Paterson, marketing vice-president.

## Supershorts

Teletype Corp. has gold-plated its 500,000th Model 32/33. It will be on display at corporate headquarters and trade shows.

– – –

A group of 13 minicomputer firms has elected to join the 1975 British Computer Caravan rather than put on their own show.

Interdata, Inc. has established a European Division of its Software Development Group to bring software development closer to the end user.

– – –

Varian Data Machines is working on the V80, which is said to be a "different kind of mini" for the firm, not a modification of its current product line.

## Justice Brief Shows

# IBM Skewed Market Figures to Cut Share

By Molly Upton
Of the CW Staff

NEW YORK – IBM's "Project Yardstick" illustrates that IBM attorneys and top management "recognized that IBM's own figures on market shares evidenced IBM's monopoly position and that these admissions had to be stopped," according to the brief filed recently by the Justice Department here in its suit against IBM.

Project Yardstick was a means by which the firm altered the base used in measuring market share in order to reduce its percentage of the market. The move, instigated at the behest of IBM attorneys who were attempting to persuade the government of the absence of IBM's market power, encountered resistance by marketing and forecasting personnel, the brief said.

George Beitzel, general manager of IBM's Data Processing Group, rejected implementation of the new approach in July 1968 for budget reasons. It was a low priority item, the brief said.

However, IBM's internal corporate counsel met with Beitzel and ordered the change which was then implemented.

### Lease-Only

IBM's new measurements included only leases and excluded purchases from IBM's market share measurements. At a management committee meeting in October 1968, the effects of alternatives, including the lease-only method, were illustrated.

"IBM market share of installed systems using the traditional method was 74% for year-end 1967. By expanding the measurement base it dropped to 60%. IBM's market share for year-end 1968 was 73.7%," according to the brief.

"Even without including the effects of expanding the market measurement base beyond systems, by using the 'lease-only' measure, IBM's 'share' of installed and on-order points dropped to 60.7%," it added.

As admitted in that presentation, the latter share would be used "only to measure market power. Other measures would be used for marketing guidance."

The lease-only share was used to present IBM's official share of the market to Washington in early 1969, the brief said.

"As shown several months later, the difference just between the two share methods was between a 71.2% share and a 48.7% share respectively," the Justice Department said.

But internally, the changes were not readily accepted. IBM forecasters in 1968 termed the proposed measurements "misleading," and the director of industry marketing said he felt his problems could best be handled without these adjustments.

But he was persuaded by Hilary Faw, who has testified he was reporting to IBM's attorneys, to adopt the new statistics, the brief said.

### Statistics Detailed

The market share statistics that IBM sought to alter with the project are also contained in the Justice Department brief, which illustrates the importance IBM attaches to maintaining its market share.

Internal statistics prepared by IBM show its market share of systems installed remained relatively constant over the period 1961 to 1972 and consistently in excess of 70% of the market, the brief pointed out.

A memo by Thomas J. Watson Jr., then chairman of the board, set as IBM's primary goal maintenance of its market share.

"It has always seemed to me relatively simple to state the goal in the following fashion – that IBM should attempt to maintain its market share in the immediate foreseeable future . . ."

IBM statisticians tracked market share in three ways: installed position, net position and net product increase. Net position measures the total value of installed systems in the market and adds to that the total value of current orders for equipment, with allowances for the equipment expected to be removed.

Differences between the installed and net position result because installed always lags behind changes in net, which records the impact of orders and displacements scheduled to occur.

Figures for the installed base of general-purpose computers, from the size range of 360/20 to 360/67, show that from 1961 through 1964, IBM held 80% of the market, except 82% in 1962. In 1965, IBM hit a high of 84% with the installation of the 360 Series.

IBM's share tracked consistently from 1966 within a range of two points from 74% in 1966 to 73% in 1972, hitting 75% in 1967-69.

Even with the inclusion of larger computers, models 360/90, 85 and 75 and competitive machines, IBM's market share of installed base was almost identical and always above 70%, Justice noted.

In terms of net position, from 1965 to 1972 for general-purpose computers, IBM was a consistent 75%, except 76% in 1970, from 1965 to 1971. During 1972, the share dropped to 71%, according to figures in the brief.

However, some variation in statistics can be viewed by comparing the installed base and the net position of large computers, which illustrates the entry of other firms, especially Control Data Corp., into this marketplace. IBM's installed position never dipped below 69% and reached 83% in 1972, the brief said.

On an installed base, IBM's share in 1965 was 78%; in 1969, 95%; and 1972, 83%. However, in net position, IBM in 1965 had 43%; 1969, 79%; and 1972, 53%.

"These differences result from the fact that the value of orders for equipment is substantially larger than the values of the equipment actually installed and that IBM had the larger share of those machines actually installed than it did of machines on order," the Justice brief explained.

# U.S. DP Shipments Seen Reaching $17 Billion in 1980: Commerce

WASHINGTON, D.C. – Shipments of computers and related equipment should grow at an average annual rate of 10% through the rest of the '70s, reaching an annual total of $17.1 billion in 1980, the Department of Commerce said in its report, *U.S. Industrial 1975 Outlook.*

This rate, however, is down from the expected 22% growth to $9.6 billion in 1974 and 14% to $11 billion in 1975, the report noted.

Exports should continue to boost the favorable balance of payments. Exports in 1975 should rise 20% to $2.8 billion. This compares with $2.3 billion in 1974, the report said.

The value of DP imports is expected to grow to $140 million in 1975, a 17% increase over the estimated $120 million in 1974.

The trade balance in the computer area will approach $2.6 billion by 1975, up from about $2.2 billion in 1974..

However, the report warned of expected competition from Japanese firms in the U.S. minicomputer market and mentioned Unidata may emerge as a factor to be considered in European markets.

"Software is generally expected to be the major area of emphasis during the remainder of this decade, subordinating hardware developments," the report noted.

"Because of such problems as annual shortfalls in programming personnel, unreliable programs and the need for new programs to handle the increased complexity of applications, users and manufacturers will be forced into a closer working relationship," the report observed.


# Introducing Eclipse.
# Suddenly a lot of computers don't look so bright.

The most expensive part of a computer isn't the computer anymore.

It's the people who work with it.

So Data General is introducing a family of medium scale computers that cut down on the work people have to do.

Eclipse.

You won't have to clean up the mistakes this computer makes. Eclipse has automatic memory error correction.

You won't have to rewrite complicated instructions every time you need them. Eclipse's microprogrammed architecture includes a comprehensive new set of instructions so powerful they do the work of entire subroutines.

You won't have to lose speed doing special subroutines with software. Eclipse has a Writeable Control Storage Unit that lets you keep them in the hardware.

You won't have to use assembly language to make your programs go fast. Eclipse is so fast it can run high level languages at assembly language speeds. (It has a bipolar memory cache that makes semiconductor memory a lot faster. Plus core and semiconductor memory interleaving for even more speed. And the fastest Floating Point Processor in the industry.)

And even though Eclipse is a brand new computer, you won't have to write a lot of systems software or jury-rig your peripherals. Eclipse is upwards compatible with the Nova line. So all the software and peripherals we've already made can go right to work on the Eclipse.

Write for our brochure. And see how bright an Eclipse can be.

# DataGeneral

The computer company you can understand.

Data General Corporation, Southboro, Massachusetts 01772, (617) 485-9100. Data Gen of Canada Ltd., Hull, Quebec, J8Y3S6, Data General Europe, 116 Rue de la Tour, Paris 75016 France. Data General Australia, Melbourne (03) 82-1361/Sydney (02) 908-1366.

# Hewlett-Packard Sales Thrust Views Terminals as New Market

NEWTON, Mass. – The Hewlett-Packard Co. (HP) is looking at the terminal market as an entirely new marketplace for that company, not just as an adjunct to its CPU sales, according to Ed McCracken, marketing manager of HP's Data Systems Division.

With the introduction of the HP 2640A [CW, Nov. 6], the firm has chosen to compete with the Dataspeed 40 market.

The HP unit does not presently contain a storage medium, but future plans call for some type of cartridge or cassette, perhaps a smaller version of the 3M Co.'s cartridge.

HP plans to gear up separate marketing and development forces for its line of terminals. The market for terminals includes not only the OEM area and sales with HP systems, but also individuals and firms that want to buy terminals, McCracken explained.

HP also plans to come out with low-priced terminals in the $1,000 range that are "glass Teletype replacements," as well as units in the $6,000 range that are user microprogrammable with off-line storage, he said.

McCracken said cost reductions will predominate throughout the mini industry.

Within three years, the price of an HP 3000 could be down to $20,000, he predicted. This would be made possible through the use of three LSI chips.

HP is "totally dedicated to obsoleting" the 3000 and its other CPUs as fast as possible, he said, explaining he feels users want cheaper machines as long as software is compatible.

Although this is a different philosophy from the past, when manufacturers had been protecting their rental base, McCracken noted HP can aim to do this since it does not directly rent its machines.

One factor that helps HP to be competitive in the OEM market is that it makes most of its own peripherals, McCracken said.

HP plans to introduce a cartridge disk system in the 15M-byte range within a couple of months, he added.

### Consolidation

In other areas at HP, the sales and service forces of HP's new Computer Systems Group have been consolidated into a single organization under Ben L. Holmes, who was named group marketing manager.

This brings together the forces of the Automatic Measurement Division and the Data Systems Division, which had been operating separately.

Richard W. Anderson, former general manager of the Automatic Measurement Division, has been appointed general manager of the Data Systems Division.

## Orders & Installations

Western States Bankcard Association has ordered $2.6 million worth of Trace item processing equipment from Recognition Equipment, Inc. The systems, one single transport and one double transport, will be used to streamline credit card processing operations.

Continental Can Company, Inc. will install turnkey minicomputer system from Mini-Computer Systems, Inc. at its Bleached Products Division plant. The system features an on-line inventory control system and dial-up access.

Cape Cod Bank and Trust Co. has ordered an automated teller information system from Datatrol, Inc. The system, a Datatrol TPS-370, will be used at 11 branch offices.

Cala Foods, Inc., a chain of 19 supermarkets, is installing three NCR 255 store systems with 21 checkout terminals and three NCR 726 computers.

Stephen F. Austin State University has ordered a Xerox 560 system to handle both academic and administrative DP as well as to provide support for the east Texas adult education program.

# THE FIRST ANNUAL COMPUTER SECURITY CONFERENCE & WORKSHOP sponsored by COMPUTER SECURITY INSTITUTE

If you have a need to know about computer security, you are invited to participate in a very special event . . . the First Annual Computer Security Conference & Workshop.

## SCHEDULE OF EVENTS AND SPEAKERS

**Monday, December 2, 1974**

**Registration & Continental Breakfast (8:15 a.m.)**

**Welcoming Remarks (9:00 a.m.)**
Robert V. Jacobson,* Conference Chairman

**"Computer Security—A Risk Management Approach"**
Peter S. Browne,* G.E. Information Services Business Division

**"A Systematic Approach To Data Security"**
Robert H. Courtney, Jr.,* IBM Corporation

**"The Role of Regulatory Agencies in EDP Records Management"**
Belden Menkus,* Consultant

**"Legal Gaps & Traps"**
Susan Nycum, MacLeod, Fuller, Muir & Godwin

**"The Internal Auditor—Should He Be A Consultant?"**
Joseph J. Wasserman,* Computer Audit Systems, Inc.

**Guest Speaker:**
Congressman Edward I. Koch of New York, co-sponsor of the "Comprehensive Right to Privacy Act"

**Luncheon**

**Afternoon Workshop Session**
Morning speakers analyze and discuss case histories/audience participation

**Hospitality Hour/Press Conference**

**Tuesday, December 3, 1974**

**Continental Breakfast (8:30 a.m.)**

**Program Begins (9:00 a.m.)**

**"System Design and Development: Security and Integrity Considerations"**
Lindsay Laire Baird, Jr.,* Advanced Computer Techniques, Security Consulting Division

**"Internal Controls To Deter Fraud and Embezzlement"**
Leonard I. Krauss, Ernst & Ernst

**"EDP Insurance: An Informed Buyer's Guide"**
Guy R. Migliaccio,* Marsh & McLennan, Inc.

**"Integrated Physical Security Systems and Procedures"**
Timothy J. Walsh, Harris & Walsh Management Consultants, Inc.

**"Auditing Software Integrity: Burglarproof Programs"**
Robert P. Abbott,* Lawrence Livermore Laboratory, University of California

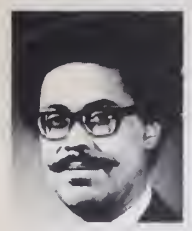
**Luncheon**

**Afternoon Workshop Session**
Morning speakers analyze and discuss case histories/audience participation

* Computer Security Institute Advisory Board Members

### CONFERENCE CHAIRMAN

**ROBERT V. JACOBSON** is involved in data security and related activities at the Chemical Bank headquartered in New York City. His diversified experience includes computer simulations of weapons and radar systems at Raytheon Company. He later joined Bolt, Beranek and Newman, Inc., and served as General Manager of TELCOMP, a pioneering time shared computer service. He founded Bradford Associates, Inc. and specialized in computer security consulting. As President, he directed projects for industrial firms and financial institutions. Bradford Associates merged with Sentor Security Group, Inc. in 1972. Mr. Jacobson was Vice President of the Consulting Division until his present affiliation with the Chemical Bank. He co-authored the book *Computer and Software Security.*



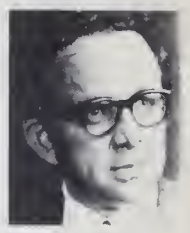
**ROBERT P. ABBOTT** is Manager of the Research in Secured Operating Systems (RISOS) Project at Lawrence Livermore Lahoratory. The goals of RISOS is to establish security guidelines for computer operating systems of the future, for existing time-shared systems, and for government agencies which in the future may be charged with certifying that a system is secured. Prior ro RISOS, Mr. Abbott was Director of the Research Data Facility, the Institute of Medical Sciences. He was also General Manager, Application Division at Berkeley Computer Corporation.

**LINDSAY LAIRE BAIRD, JR.,** is General Manager of Advanced Computer Techniques, Security Consulting Division. He has recently completed service in the U.S. Army's Military Police Corps as a Lieutenant Colonel. His experience includes law enforcement, industrial security, physical security and contract administration including eleven years in data processing and nine years in intelligence and classification management. He developed the Army's first automated police management information system and authored the first comprehensive Army regulation to estahlish D.P. security criteria.

**PETER S. BROWNE** is Manager of Security Operations for the G.E. Information Services Business Division. Prior to joining G.E., he was responsihle for the development of the computer security program at State Farm Mutual Auto Insurance Company. He has dealt with security of computer information as a staff officer in the Air Force. His computer hackground was as a programmer, senior analyst and systems designer. Mr. Browne is active in many national professional societies, was chairman for two ACM chapters and frequently speaks on the subject of computer security.

**ROBERT H. COURTNEY, JR.** is IBM's Manager of Data Security and Privacy. He is responsihle for estahlishing architecture and design criteria for data security in IBM's hardware and software, and assuring their incorporation into these products. He joined IBM in 1960 as Manager, Intelligence Systems Department, in the Federal Systems Division in Washington. He later managed the Displays and Graphics Development group which introduced display and graphics into the IBM product line. Mr. Courtney's work is published in the proceedings of numerous conferences and symposia, IBM puhlications and in the Computer Law Service.

**LEONARD I. KRAUSS** is a Management Consultant at Ernst & Ernst. His experience is in the areas of planning and control systems, data processing management, and information systems security. His systems planning and development experience includes a variety of computer applications for financial institutions, manufacturers and service companies. Mr. Krauss was previously associated with IBM and Union Carhide. He has written three hooks including SAFE: *Security Audit and Field Evaluation for Computer Facilities and Information Systems.*

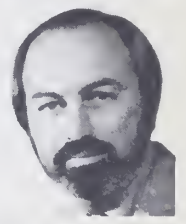


**BELDEN MENKUS** has spent twenty years helping management improve administrative systems and information handling techniques. He is a regular contrihutor to *Administrative Management* and an advisor to *Security Letter.* In 1963 he founded *Records Management Journal* and edited it for five years. Mr. Menkus lectures and writes extensively and was a recent contrihuting editor to the *Computer Security Handbook.* He is listed in current editions of Who's Who in Computers and Data Processing, Contemporary Authors and the Working Press of the Nation.

**GUY R. MIGLIACCIO** is an Assistant Vice President at March & McLennan where he has heen actively involved in the insurance aspects of computer security. He frequently analyzes and measures risk exposures for clients and has developed insurance programs to cover those risks. He conducts seminars for the National Risk Management Conference sponsored hy the American Society of Insurance Management. He frequently speaks at computer security seminars sponsored hy the American Management Association. Mr. Migliaccio has also contrihuted to the *Computer Security Handbook.*

**SUSAN H. NYCUM** is an Attorney with MacLeod, Fuller, Muir & Godwin where she has concentrated on computer law. Mrs. Nycum is the principal legal consultant to the Stanford Research Institute's computer ahuse project. She was formerly Director of Stanford University Campus Computer Facility and is currently Chairman, Standing Committee on Legal Issues of ACM. She is a memher of the Bar of California, Pennsylvania and the United States Supreme Court.

**TIMOTHY J. WALSH** is President of Harris & Walsh Management Consultants, Inc. Earlier he was Security Manager with the Sperry Gyroscope Division of Sperry Rand Corp. and with the former A.B. DuMont Lahs. He served with the U.S. Naval Intelligence Service and the U.S. Air Force Office of Special Investigations. Mr. Walsh is a memher of the New York, federal and U.S. Supreme Court bars. He is a former President and Board Chairman of the American Society for Industrial Security and a former adjunct assistant professor at N.Y.U.



**JOSEPH J. WASSERMAN** is founder and President of Computer Audit Systems, Inc. He has held management positions with the Bell System including the Internal Audit Manager of AT&T. He was also Manager of Audit Development and Research for Bell Lahoratories, heing responsihle for internal controls in all systems designed, evaluation of testing and conversion procedures, and insuring the future auditability of all management systems. Mr. Wasserman lectures widely and has written extensively. His reports on computer security, as published in the New York Times, was reprinted in the Congressional Record.

### GUEST SPEAKER

**CONGRESSMAN EDWARD I. KOCH** of New York has heen devoting his full time to a wide variety of timely issues since he went to Congress in 1969. He has heen a long time advocate of the right to privacy and has recently sponsored several bills including H.R. 667 and H.R. 14163. The latter, which he sponsored with Rep. Barry M. Goldwater, Jr., would estahlish a Federal Privacy Board and regulate the collection of data in hoth the private and public sectors. Rep. Koch serves on the Banking and Currency Committee and the House Committee. He is a member of four suhcommittees of the Banking and Currency Committee: Urhan Mass Transportation, Consumer Affairs, Small Business, and International Trade.

### REGISTRATION INFORMATION

**REGISTRATION:** Attendance is limited and reservations will he accepted on a first-come, first-served hasis. For an immediate reservation call (617) 393-3666. Or use the clipout form helow.

**REGISTRATION FEE:** The registration fee of $350 for the two day session is payahle in advance and includes the cost of continental breakfast, workshops, workhook and the hospitality hour which follows the first day's program. The fee for Computer Security Institute members is $225. Please make check payahle to the "Computer Security Institute."

**AN IMPORTANT NOTE:** If you attend the Conference as a non-memher at the $350 rate and later decide to join the Computer Security Institute, you will he credited the difference hetween the memher and non-memher rate . . . provided that you make application within 30 days after the Conference.

**GROUP REGISTRATION:** Your company might want to take advantage of this unique program and send a "team." Company team registrations are: Second person — $295; Third person — $275; Each addition person — $260. For information on large group rates, please call the Computer Soclety Institute.

**ACTION CHECKLISTS** A special "extra." You will receive a set of diagnostic checklists which will help you to evaluate the level of your own security program. The two part format is designed to red flag real or potential prohlems. Part one reveals the prohlem. Part II offers suggestions for corrective action.

Location: THE PLAZA HOTEL • TERRACE ROOM • 5th Avenue and 59th Street • NEW YORK CITY

Computer Security Institute
Five Boston Post Road/West Main Street
Northboro, Massachusetts 01532
(617) 393-3666

Please enter_____ reservation(s) in my name for the FIRST ANNUAL COMPUTER SECURITY CONFERENCE & WORKSHOP
December 2 & 3 · New York City · The Plaza Hotel

☐ Check Enclosed* ☐ Bill My Company ☐ Bill Me
*Make check payable to the "Computer Security Institute"

☐ Send me information on Computer Security Institute membership

☐ Sorry, I can't make it this time, but send me information for the next program.

Name_____ Title_____

Company_____ Phone ( )_____

Address_____

City_____ State_____ Zip_____

LIST NAMES OF ADDITIONAL ATTENDEES ON SEPARATE SHEET

*Progress Report:*

# 370/STOR 145

## IT'S THE THINGS THAT ARE DIFFERENT THAT MAKE THIS MEMORY SO SUCCESSFUL.

370/STOR 145 is an expansion memory for IBM 3145 processors. In less than a year, it has become the dominant product in its market. Why? For one thing, security. Model 3145 users know Cambridge is the only independent supplier that designs, manufactures, sells and services the systems we install. For another, performance. 370/STOR 145 is different from any other 3145 add-on memory; and it is these differences that make it attractive.
For example:


### NO FLOPPY DISK MODIFICATION

A user can add 370/STOR 145 memory, in any size increment, without tampering with the console file. No patch decks are required, ever. So what happens on your "floppy disk" is between you and IBM. Cambridge doesn't get involved.


### NO CPU ALTERATION

370/STOR 145 installs directly to your 3145 processor. No wiring changes. No model changes when you expand memory beyond your current model's capacity. That means Cambridge can increase your model 3145 memory to a full two megabyte capacity without any CPU alteration.


### UNIQUE MEMORY PROTECTION

370/STOR 145 detects and corrects all single-bit errors, and detects multi-bit errors. So do other 145 memories. So to be different we add a reconfiguration switch to let you dial out failed 370/STOR memory, *plus* an off-line switch to dial out failed IBM memory. Either way, you keep running.


### HIGHEST MEMORY ADDRESSING

Even IBM must change address lines when you add its memory. But not Cambridge. 370/STOR 145 is directly addressable up to 2048K without any change. It floats on top of any IBM address level. That's the secret of our modular expansion, lack of CPU alteration, and freedom from console file tampering.

## CAMBRIDGE.

A good place to put your information.

cmi Cambridge Memories, Inc. 12 Crosby Drive, Bedford, Mass. 01730 (617) 271-6400

Contact our sales offices for further information: Boston (617) 271-6400 • Hartford (203) 633-8714 • Philadelphia (215) 295-1186 • Columbus, O. (614) 459-0154 • Kansas City (913) 371-3352 • Atlanta (404) 252-1382 • San Francisco (415) 692-4806 • New York City (201) 947-0184 • Rochester (716) 637-2229 • Chicago (312) 449-5260 • Detroit (313) 557-4080 • Washington, D.C. (301) 657-9015/6 • Dallas (214) 231-4804 • Los Angeles (213) 822-1166 • Charlotte, N.C. (704) 568-1787.

Detach here, moisten and seal envelope securely before mailing.

Fold and insert order form (attached through binding) and remittance here.

# Use the attached order form and this envelope for:

- **A new subscription**
- **New address**
- **New Title**
- **New Industry**

Order form is attached through binding. Be sure to include current label or label information when making a change.

First Class
Permit No. 40760
Newton
Mass.

**BUSINESS REPLY MAIL**

No postage stamp necessary if mailed in the United States

Postage Will Be Paid By

COMPUTERWORLD
797 Washington Street
Newton, Mass. 02160

CIRCULATION DEPARTMENT

## A Question of Bundling

# Decision on Univac-USC Case Reserved

By Molly Upton
Of the CW Staff

PHILADELPHIA – Judge Clifford Scott Green has twice reserved decision on Univac's pleas to dismiss the case brought against it by United Software Corp. (USC). The independent supplier of a tape labeling package seeks a preliminary injunction barring the release of Univac's Ansi standard 1 tape labeler for the 1108 unless Univac charges separately for the product.

USC sells tape labeling packages for use on Univac Series 1100 computers.

Although the suit is limited to seeking unbundled prices on the tape labeler portion of the operating system, it could have more far-reaching effects by encouraging Univac to reconsider its bundling policy.

### Tie-In Arrangement

During the trial, USC has argued that Univac's bundling policy violates antitrust laws because it constitutes a tie-in arrangement. Univac's premature product announcements have also served to stifle competition, the plaintiff argued.

In addition, USC charged that Univac had threatened to withdraw some of its on-site support for its operating system at certain installations if the user installed a foreign tape labeler.

As a result of this threat, USC said, the user canceled his order for a USC tape labeler.

### Probst Cbema Chairman

WASHINGTON, D.C. – Gerald G. Probst, president of Univac, has been anmed 1974-75 chairman of the board for the Computer and Business Equipment Manufacturers Association (Cbema).

Martin Goetz, Applied Data Research vice-president of marketing, testified as an independent expert at the request of USC that bundling had an anticompetitive effect.

### Stifles Growth

Bundling stifles the growth of independent software firms by making it almost impossible for them to sell products for bundled machines, he said.

In addition, Goetz continued, bundling has an anticompetitive effect on users as they face little choice in the selection of software.

The scope of software for Univac units could be much larger if users were charged for Univac's software since independents would bring out products.

Goetz also testified that unbundling would be good for Univac, enabling it to recoup some of its large software development costs.

Unbundling could also lead to development of software in response to demand, he said.

### Management Decision

Neil Gorshaw, a Univac vice-president, explained bundling was a management decision based on marketing considerations.

USC, a spokesman said, contends that one of the purposes for Univac's bundling of its operating system is to prevent independent software houses from zeroing in on certain software packages that might be somewhat weaker than independent products.

# Honeywell, GE Revise Agreement To Simplify Acquisition Provisions

MINNEAPOLIS – Honeywell, Inc. and General Electric Co. have revised their agreement providing for Honeywell's acquisition of GE's 18.5% interest in Honeywell Information Systems, Inc.

Under the new provisions, the number of shares of Honeywell common which GE will receive will vary depending on when the option is exercised and will increase in annual increments. The old agreement was more complex involving a number of variables which could have been affected by stock market conditions.

If GE exercises the option in 1976, it will receive 1.5 million Honeywell shares, 1.8 million shares in 1977 and if either GE or Honeywell exercises the option in 1978, GE will receive 2.2 million Honeywell shares.

GE's interest in HIS must be exchanged for Honeywell common by mid-1979 if the option has not been previously exercised.

### Forrester Reappointed

CAMBRIDGE, Mass. – Jay W. Forrester, inventor of a random-access memory, has been reappointed Germeshausen Professor of Management at MIT's Alfred P. Sloane School of Management for a three-year period.

Forrester holds the basic patent for random-access, coincident-current magnetic storage. He was responsible for the design and construction of Whirlwind 1, and has written several books on systems dynamics.

## Executive Corner

### MDS Chairman Resigns

HERKIMER, N.Y. – Richard P. Rifenburgh has resigned as chairman and a director of Mohawk Data Sciences Corp. Rifenburgh was previously president and chief executive. He is succeeded in all three posts by V.E. Johnson, who has been president since July.

### Other Moves

■ Benjamin F. Robelan, vice-president and treasurer of Prime Computer, Inc., has been designated acting president and chief executive officer for the company, following the resignation of Robert C. Baron. Baron will continue to serve as a director and consultant for the firm.

■ Otis Page has resigned as vice-president of marketing at Shugart Associates. The action came shortly after the resignation of Alan Shugart as president and member of the board of directors.

Page remains on the board and is acting as a consultant to the firm. Director of sales Farrell Sanders has assumed marketing responsibilities.

■ C.E. Griffin has resigned as executive vice-president of Systems Engineering Laboratories, Inc. Lloyd D. Turner is his successor.

■ James MacGuire has resigned as executive vice-president of field operations of Storage Technology Corp. but will continue as a consultant to the firm on special projects and as a director.

## Position Announcements

POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS

## DATA BASE/ DATA COMMUNICATION ANALYST

IMS/VS support team now forming. Outstanding opportunity for aggressive team player to participate in 370/158 IMS implementation. Candidate should have previous IMS experience including data base design and definition, IMS access method trade-offs, and logical relationships. IMS application back-out and error recovery helpful. Excellent starting salary and benefits including educational subsidy. Submit resume and salary requirements to: **Personnel Services, University of Alabama in Birmingham, 217 Bishop Building, 900 South Nineteenth Street, Birmingham, Alabama 35233.** *An Equal Opportunity/Affirmative Action Employer.*

## SOUTH EAST ASIA

**A Technical Studies Manager and 5 EDP Instructors are Required Immediately.**

The Assignment is for a Maximum of Two Years in Indonesia. Terms and Conditions of Employment are Excellent.

OS/VS IMS background with ability to design and implement total programme is necessary. Only individuals with evidence of this experience need apply.

Call or visit Patricia J. Blankenship.

INDUSTRIAL RELATIONS SEARCH
3303 Wilshire Bl., L.A., Calif. [213] 380-2200

DIRECTOR FOR UNIVERSITY SYSTEMS DEVELOPMENT $22,000 to $24,000 per year; It is expected that this range will increase in January). Will assist the Director of Administrative Data Processing in developing, recommending and implementing administrative data systems to meet the short and long-range management needs of the University. Requires a bachelor's degree in Business Administration or closely related field, and eight years experience in programming and systems analysis, including two years in the management of administrative data systems projects with supervisory responsibility for a professional staff of five or more. Experience with data base and data communications systems preferred. A graduate degree and experience with a university or government agency are also desirable. Resumes should be submitted to the **University of Washington Staff Employment Office, 1415 N.E. 45th, Seattle, Washington 98195,** not later than 5:00 p.m., November 27th. It is anticipated that competitive applicants will be asked to appear for oral interviews sometime during the week of December 16th.

### TECH SUPPORT ANALYST MGR TO $24,000

Major oil co. seeks person 3-5 yrs exper in tasks related to diagnosing, coding & implementing changes to vendor software. Prefer exper on minicomputer, sensor-based system.

CALL SKIP WALL
(405) 521-9935
SOUTHWEST CAREERS
4444 CLASSEN BLVD.
Oklahoma City, Ok. 73118

### EDP CAREER OPPORTUNITIES WITH A LEADING ELECTRIC UTILITY

APPLICATIONS PROGRAMMERS:
Join an organization which is utilizing top-down design, structured programming, and other new programming technologies. IBM 370/158-OS/VS2/HASP/Time-Sharing environment. Positions require 1-2 years of Cobol programming experience. Prefer college degree and OS background.

Excellent fringe benefits located in a "good living" area

**Send resume include salary requirements, in Confidence to M. Fishburne**
**P.O. Box 1551, Raleigh, N.C. 27602**
*Carolina Power & Light Company*
*An Equal Opportunity Employer M/F*

## Sr. Programmer/Analyst

Growth and aggressive utilization of our one half meg 370/145 operating under OS/VS1 has created a challenging position opening on our Data Center staff. Candidates with 2 plus years of programming experience in PL/1 or COBOL and production systems analysis are sought. Knowledge of OS (preferably VS1 or MFT) and CICS is required. Previous production systems experience in pharmaceutical, food or chemical manufacturing industry is preferred.

The successful candidate will be responsible for the design, programming, and implementation of an extensive production system including related areas such as cost and purchasing departments.

Our small city (population 10,000), located in rural Central New York State, offers opportunity for a rewarding on-going career in an environment supporting more complete life style.

Send resume including salary history to
Stuart P. Spence, Sr. Employment Representative

**Norwich Pharmacal Co.**
Division Morton-Norwich Products, Inc.
Norwich, New York 13815
*An equal opportunity employer, M/F*

## TECHNICAL COMPUTING CONSULTANT

Diamond Shamrock Corporation is a Cleveland based firm, highly diversified in chemicals and oil and gas. We have an immediate opening for a technical computing consultant who will work with technical personnel on utilization of the computer for solving scientific and engineering programs.

Candidates should have a BS degree in a technical discipline plus a minimum of three years experience in technical computer applications with ability to program in Fortran. IBM – OS-JCL experience also required. Experience on IBM's VS2 system preferred.

Excellent career opportunity with growing organization. Salary commensurate with experience; comprehensive benefit package. Send resume, including salary requirements to:

Christine Belz
Employment Representative
DIAMOND SHAMROCK CORPORATION
1100 Superior Avenue
Cleveland, Ohio 44114

*All replies maintained in strict confidence.*
*An Equal Opportunity Employer M/F*

## SALESMAN WANTED

Leading computer ribbon manufacturer seeks experienced Sales and Managerial personnel, representatives, etc.

Excellent opportunities for men now selling computer ribbons, typewriter ribbons and computer tapes.

CW Box 4216
797 Washington St.
Newton, Mass. 02160

## PROGRAMMERS/ANALYSTS PROJECT LEADERS/MANAGERS

**Do You Qualify & Have Experience in**

Data Base Management – On Line Systems Distributed Data Processing – Top Down Design Structured Programming.

If you have pertinent experience in systems, and Data Processing, know how to use COBOL, Mark IV and DB/DC Software, have a degree (or equivalent experience) We could be interested in you.

Clean Environment – Secure Challenging Work,
Competitive Salaries – Good Retirement
Ample Vacations & Holidays

Send detailed resume:
State Personnel Division
Recruitng Unit
700 Knox Abbott Drive
Cayce, S.C. 29033
*An Equal Opportunity Employer*

## Customer Service Engineers

Jr. CE .....to$1100 mt.
CE .....to $1300 mt.
Sr. CE .....to $1500 mt.
Tech Spec. .....to$Plus mt.
Field Mgrs. ..... Sal Neg. mt.

We're specialists in "Customer Engineer" Extractions.

Bill Gill And Associates
5724 W. Diversey Av.
Chicago, Ill. 60639
(312) 622-7711

*Computer Professionals*

## *Nothing succeeds like excess!*

There is only one best way to advance your career most effectively, and that is by looking at the maximum number of opportunities available to you.

The time for that is right now. Never before have we had such an excessive number of career opportunities. Far more than you could find anywhere else.

Take advantage of the urgent demand for your services. Contact your nearest ESP Associates office today – for a brighter tomorrow.

**CHICAGO**
McCormick & Associates, Inc.
386 North York Street
Elmhurst, Illinois 60126

**CLEVELAND**
McCormick & Associates, Inc.
601 Rockwell Avenue
Cleveland, Ohio 44114

**COLUMBUS**
Thornewall-Delaney Associates
926 E Broad Street
Columbus, Ohio 43205

**DALLAS**
Data Processing Careers
Suite 1109
Stemmons Tower West
Dallas, Texas 75207

**DETROIT**
Electronic Systems Personnel
1705 Fisher Building
Detroit, Michigan 48202

**HARTFORD**
Compass, Inc.
900 Asylum Avenue
Hartford, Connecticut 06105

**MINNEAPOLIS/ST. PAUL**
Electronic Systems Personnel
801 Nicollet Mall, Suite 1716
Minneapolis, Minnesota 55402

**NEW YORK**
Botal Associates
405 Lexington Avenue
New York, New York 10017

**PITTSBURGH**
Electronic Systems Personnel
106 Lawyers Building
428 Forbes Avenue
Pittsburgh, Penna 15219

**SAN FRANCISCO**
The Computer Resources Group Agency, Inc.
303 Sacramento Street
San Francisco, Cal 94111

**WASHINGTON, D. C.**
ESP Systems Corporation
Suite 210
1211 Connecticut Ave. N.W.
Washington, D C. 20036

esp associates

### PROJECT MANAGER AUTOMATED MAPPING PROGRAM

**SALARY TO $24,024**

Office of Assessor, County of Alameda, Calif., has created a position to coordinate the development of an automated mapping program. Requires B.A., plus five years' experience in systems analysis, programming, management, compugraphics, and data base management systems. (Additional experience may be substituted for the required education).

**Apply: Dept. of Personnel**
**1221 Oak Street**
**Oakland, CA 94612**
**(415) 874-7337**

## SYSTEMS ANALYSTS

The Catholic University of America has an immediate opening for a System Analyst to work in its Admissions, Financial Aid and Student Records function. This opening is for an individual with a min. of 3 years progressive systems experience in university-student records-keeping and COBOL programming. Since we have a time-sharing communications orientated Dec System 10, it is desirable that the candidate have similar computer experience with terminal orientated systems. We offer a liberal salary program and benefit package including 19 paid holidays and tuition assistance for employee and dependents. For further information about this career position, send your resume with salary requirements to:

J.K. Milligan
Catholic Univ. of America
620 Michigan AVe., N.E.
Washington, D.C. 20064
*An Equal Opportunity Employer*

## Computerworld Sales Offices

**Vice President – Marketing**
*Neal Wilder*
**Sales Administrator:**
*Dottie Travis*
COMPUTERWORLD
797 Washington Street
Newton, Mass. 02160
Phone: (617) 965-5800
Telex: USA-92-2529

**Northern Regional Manager**
*Robert Ziegel*
**Account Manager**
*Mike Burman*
COMPUTERWORLD
797 Washington Street
Newton, Mass. 02160
Phone: (617) 965-5800
Telex: USA-92-2529

**Eastern Regional Manager**
*Donald E. Fagan*
**Account Manager**
*Frank Gallo*
COMPUTERWORLD
2125 Center Avenue
Fort Lee, N.J. 07024
Phone: (201) 461-2575

**Los Angeles Area:**
*Bob Byrne*
Robert Byrne & Assoc.
1541 Westwood Blvd.
Los Angeles, Calif. 90024
Phone: (213) 477-4208

**San Francisco Area:**
*Bill Healey*
Thompson/Healey Assoc.
1111 Hearst Bldg.
San Francisco, Calif. 94103
Phone: (415) 362-8547

**Japan:**
*Ken Suzuki*
General Manager
Dempa/Computerworld
1-11-15 Higashi Gotanda
Shinagawa-ku, Tokyo 141
Phone: (03) 445-6101
Telex: Japan-26792

**United Kingdom:**
*Michael Young*
c/o IDC Europa Ltd.
140-146 Camden Street
London NW1 9PF, England
Phone: (01) 485-2248
Telex: UK-26-47-37

**West Germany:**
*Otmar Weber*
Computerworld GmbH
(8) Muenchen 90
Tegernseer Landstrasse 300
West Germany
Phone: (089) 690-70-52
Telex: W.Ger-52-81-08

POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS

## CAREER OPPORTUNITIES

(When's the last time a deer came into your backyard? Our client engaged in advanced computer oriented navigation systems is located in Grand Rapids, Michigan – The way America Used To Be. Immediate positions are available in the following disciplines:)

IMPLEMENTATION SOFTWARE ENGINEER; Expertise in design coding, simulation, efficient implementation of computer programs for real time airborne computations. Assembler language techniques, math, or computer science engineering plus Fortran is required.

AVIONICS SYSTEMS ANALYST: Design and analysis of inertial guidance or weapon delivery systems. Radial navigation sensors like LORAN, OMEGA, DME. Advanced degree, background in optimal filtering, systems simulation or communications techniques helpful.

SR. APPLICATIONS PROGRAMMERS: Program design, coding, implementation of systems involving engineering and scientific applications. Solid IBM System 360-370 assembly language & JCL experience required. Good background in Fortran IV on large scale computers.

SOFTWARE DESIGNER/ANALYST: LORAN & OMEGA navigation systems analysis is required and a Masters or equivalent in digital signal processing. Helpful experience would be in such areas as ECCM, Satellite Navigation, adaptive filtering, digital phase lock loops, Receiver & DPR interface.

Confidential applications are invited from those who meet the above qualifications as well as those with expertise at junior-senior levels in related areas.

Send resume (or call) including salary history to:

Mr. W.W. Kennedy
REPUBLIC INTERNATIONAL CORP.
P.O. Box 340716
Coral Gables, Florida 33134
(305) 864-9529

*(Employer retained corporate consultants)*

## Academic Computer Center Director

To assist faculty and students engaged in research in developing statistical designs, and computer processing of research data. Position carries academic rank and salary commensurate with academic background and experience. Some teaching in mathematics or statistics required.

Send Resume to Dr. John P. Mundy, Director for Administrative Affairs, Madison College, Harrisonburg, Virginia 22801.

*An equal opportunity employer*

## DATA PROCESSING PROGRAMMER-ANALYST POSITIONS

Expanding computer applications in rapid growth company has created several additional openings in our Data Processing Division.

- Career Positions
- Professional work environment
- Individual growth and development

Two to six years experience in systems and/or programming is necessary. Experience in teleprocessing and on-line data base applications would be an asset. A four-year college degree is preferred. Excellent salary structure and fringe benefit program. Please submit resume to Personnel Manager:

**FS SERVICES, INC.**

1701 Towanda Avenue, Bloomington, Illinois 61701

*An Equal Opportunity Employer*

## Operating Systems Programmer

Challenging opportunity at a large research computer center. Requires Bachelor's degree or equivalent in Computer Science or Mathematics and a minimum of 2 years experience in operating systems programming for CDC. 6600 and/or 7600 computers.

*Send resume and salary history to:*
Virginia H. Wilson, Personnel Representative
**Brookhaven National Laboratory**
Associated Universities Inc.
Upton, Long Island, N.Y. 11973

*An Equal Opportunity Employer M/F*

## UNIVERSITY OF MASSACHUSETTS-AMHERST

DATA BASE ADMINISTRATOR position available. Bachelor's degree or equivalent professional experience. Five years programming & systems background in educational administrative computing center. Data base management system experience. Salary commensurate with qualifications. Resume by December 15, 1974 to Bard F. White, Director of Management Systems, Whitmore Administration Building, 01002. The University is an Affirmative Action/Equal Opportunity Employer.

## EDP MEN & WOMEN A GOLDEN OPPORTUNITY

You can earn an extra $25,000 or more per year while still retaining your present position by selling Computer ribbons, Computer Tapes, and Typewriter ribbons. Manufacturer pays commission each month. Terrific repeat business.

CW Box 4229
797 Washington St.
Newton, Mass. 02160

## SYSTEMS ENGINEER

To work for major computer leasing company. Will provide technical support to field marketing organization as well as to customers.

Must be experienced with IBM System/360 or System/370 and DOS.

Must be willing to travel. Will be headquartered in Englewood, New Jersey.

Send resume to:
Peter Beaven
Manager of Systems Engineer.
Diebold Computer Leasing, Inc.
177 North Dean Street
Englewood, New Jersey 07631

## SYSTEMS ANALYST-PROGRAMMER

EXCELLENT OPPORTUNITY for position in analysis, design and implementation of engineering and management applications for a major Boston consulting civil engineering firm, including project control, accounting and personnel data retrieval. Includes feasibility studies, hardware and software evaluation, systems analysis and design and programming.

Bachelor's degree in math, engineering or one of the sciences; three to five years programming experience in business systems; knowledge of Fortran, Cobol and Assembly languages; knowledge of accounting concepts desirable; experience with data base management systems a plus; ability to communicate effectively with all levels of management; good analytical and communicative skills.

Attractive quarters in new office tower near park and downtown shopping center. Fringe benefits include profit sharing and educational assistance. All applicants will be considered on the same basis, without regard to race, color, religion, sex or national origin. Please call:

Personnel Department
(617) 523-8300

FAY, SPOFFORD & THORNDIKE, INC.
One Beacon Street
Boston, Mass. 02108

*An Equal Opportunity Employer M/F*

## DATA PROCESSING

Positions available in the Educational Data Processing Center of the Baltimore City Public Schools.

**Program Developer:** Assist the Staff Director in the management and direction of programming and implementation of Systems. A Master's Degree is preferred and at least 3 years experience in a similar position.

**Systems Designer:** Assist the Staff Director in managing systems design in the Center. A Master's Degree is preferred and at least 5 years experience in a similar position.

**Educational Specialist:** Senior Systems Analyst in the design of Educational Systems for Modern Multi Programmed 370/145 Computer. At least 3 years experience.

**Staff Specialist:** Assistant to Operations Manager in the operation of the Data Center. At least 2 years experience.

Mrs. Alice Ford
Specialist, Division of Personnel
Baltimore City Public Schools
3 East Twenty-Fifth Street
Baltimore, Maryland 21218

## SYSTEMS PROGRAMMER

### Mini-Computer Software Specialist

We can put you to work as a Scientific Programmer for our clinical analyzer product line, if you have at least 3 years experience with assembly language, mini-computer and disc operating systems. Background in Life Sciences is desirable along with some supervisory experience.

This is your chance to be successful and work with a computer system – associated biomedical instrumentation and be creative.

We are offering an excellent salary and benefit program including stock options. Please send resume with salary history to:

Beth Jennings
Personnel Assistant
**AMERICAN INSTRUMENT COMPANY**
8030 Georgia Avenue
Silver Spring, Md. 20910

*An Equal Opportunity Employer M/F*

## Senior Programmer/ Analysts

### S/370-H6000

Will have responsibility for analysis, specification definition, programming, documentation, and user coordination in a variety of insurance and financial projects in a large OS environment.

Requires 2-3 years' experience as a Programmer/Analyst using one or more of the following: COBOL, GMAP, BAL. Familiarity with IMS, GECOS and Data Communications for S/370 or H6000 helpful for future advancement.

We offer excellent starting salaries, a complete employee benefits package and excellent advancement opportunities.

Apply in person, by resume, or call, 956-2091, Personnel Department, 2nd Floor, 100 Summer Street, Boston, Mass. 02106.

Blue Cross Blue Shield of Massachusetts

MASSACHUSETTS Dental Service CORPORATION

*An Equal Opportuntiy Employer*

POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | POSITION ANNOUNCEMENTS | BUY SELL SWAP | BUY SELL SWAP

PROGRAMMERS
SYSTEM ANALYSTS

## Vepco

Vepco has several career opportunities in its Management Information Services Department for experienced programmers and system analysts. We offer the opportunity to be involved in systems design, systems programming, data base design and communications. Experience on 370, OS, and/or TP helpful. We provide competitive salaries, excellent benefits, a potential for personal and professional growth and a result oriented environment. Please send resume with salary requirements to:

Supervisor-Employment Services
P.O. Box 26666
Richmond, Virginia 23261
*An Equal Opportunity Employer*

COMPUTER PROFESSIONALS

Expanding Data Center with a new 370/158 computer is located in Central New York State. Our client seeks the following professionals immediately.

All successful candidates must be degreed & willing to assume project responsibilities.

**PROJECT LEADER 19K**
2-3 yrs financial systems in mfg. envir. Super. 6-8 prog/analyst

**LEAD ANALYST ..... 17K**
1-3 yrs. mfg. systems exper. TP-370/158 desirable.

**SR. PROGRAMMER 16K**
2 yrs. min. heavy Cobol, BAL, 370/OS-DOS exper.

**PROG/ANALYST ..... 14K**
1 yr. of Cobol app. some systems exper.

**Career Advisors**
125 Wolf Road, Suite 408
Albany, N.Y. 12205
(518) 458-1810
Our client companies assume all fees.

## SYSTEMS PROGRAMMER (SR.)

Minimum Education: B.S. Degree in Computer Science. E.E., Math or related fields. Required knowledge—BAL. Preferred experience — OS/MVT and HASP.

Computer Environment IBM Model 168 with the VS2 Release 1.7 Operating System serving the University's four campuses in areas of Academic, Administration and Health.

Responsibility: Implement, document, and maintain user application software for the Computer Network. Includes: Statistical packages, mathematical subroutines, simulation and formula manipulation packages and special compilers.

Send resume and salary history to:

University of Missouri
Personnel Services
309 Hitt St.
Columbia, Mo. 65201
(314) 882-4221
*An equal opportunity employer*

## ANALYST/PROGRAMMER FINANCIAL SYSTEMS

Central New York State location of international corporation. Candidate must be mature and able to communicate with users. Must be capable of contributing to system and program design and assuming responsibility for programming and implementation. Accounting background required.

CW Box 4243
797 Washington St.
Newton, Mass. 02160

## MIS

Career Building Opportunities/Miami, Florida

Continued rapid growth of BURGER KING — a national leader in the dynamic, fast food industry — has created several important positions in the MIS department for capable professionals.

### TECHNICAL SPECIALIST

Will serve as internal consultant to all levels of DP management in troubleshooting, training, hardware/software analysis on BURROUGHS medium systems. Data communications experience essential. Familiairty with NDL, general communications and business applications using COBOL required.

### PROGRAMMER/ANALYST

Requires 3-5 years experience in financial applications and general business systems using COBOL. Exposure to BURROUGHS hardware desirable. Must be able to work independently on a project basis.

Starting salaries are in the mid teens. Relocation costs to Miami company paid.

Send resume and salary history to
U.J. Baetty, Corporate Personnel
BURGER KING CORPORATION
P.O. Box 520783, Biscayne Annex
Miami, Florida 33152
*An Equal Opportunity Employer, M/F*

# Buy Sell Swap

MAGNETIC TAPE
FOR SALE!!!

Recertified 100% Guaranteed Trouble Free

1600 BPI 2400 feet
3200 FCI 9 track - $5.47

800 BPI 2400 feet
full width tested - $4.97

Seals or thin line canisters

Call Miss Joan
(703) 339-7050

Precision Methods Inc.
8825 Telegraph Road
Lorton, Virginia 22079

## I/O SETS
## AVAILABLE IMMEDIATELY
## $78,000

(Will Also Lease)
Contact: Harry Blair
Computer Installations Corp.
(713) 524-1401

For the End User's Answer When Buying, Selling or Leasing - IBM 360, 370, 1401, System 3 Unit Record Equip.-Please Call or Write

**COMPUTER CLEARING CORPORATION**
5025 N. Central Expressway
Suite 3046 Dallas, Texas 75205
Telephone (214) 528-5087
18 Years Experience, and — "We guarantee delivery at a fair market price."
Geroge Jachimiec, President

## FOR SALE

UNIVAC 9200 16K CARD SYSTEM
W/1001 CARD CONTROLLER

250 LPM Printer, 96 POS; 8K Mem. w/two 4K stor. exp.; 400 CPM card rdr.; 75/200 CPM card pch.; Multiplexor I/O channel; 1000/2000 CPM card ctrlr; 1001 control; two file feeds.

AVAILABLE NOW
Contact: Gary Johnston
(216) 464-3881

BUY • SELL • LEASE • TRADE

## IBM 360/370
## UNIVAC • CDC
## HONEYWELL

Flexible plans, low rates, fast service on systems & peripherals.

CALL US

| | |
|---|---|
| WASHINGTON | (703) 521-2900 |
| NEW YORK | (201) 871-1890 |
| PITTSBURGH | (412) 921-3077 |
| ATLANTA | (404) 393-1309 |
| CHICAGO | (312) 343-0406 |
| ST. LOUIS | (314) 878-4741 |
| KANSAS CITY | (816) 471-7376 |
| DALLAS | (214) 637-5010 |
| HOUSTON | (713) 447-0325 |
| LOS ANGELES | (714) 645-3712 |
| SAN FRANCISCO | (415) 928-7202 |
| PORTLAND | (503) 297-4721 |
| HAMBURG | 040 50 30 21 |
| GENEVA | 022 61 27 54 |
| PARIS | 758 12 40 |

ComputerLeasing
2001 Jefferson Davis Hwy., Arlington, Va. 22202
Brokers Inquiries Invited
Member, Computer Lessors Association

## 2314-A1

60ms ACCESS
Any combination

SALE LEASE TRADE
AVAILABLE IMMEDIATELY
COMPUTER MARKETING, INC.
(215) 635-6112

ACS
FOR SALE
65K 1.5u
MODEL 30 SYSTEM
COMPLETE WITH I/O SET
AND 5/2311's
8K MODEL 20
W/2203 AND 2560
*Member Computer Dealers Assoc.*
ACS Equipment Corporation
8928 Spring Branch Drive
Houston, Tx 77055
(713) 461-1333

## SPECIAL SALE

— Disk Packs —
Refurbished
2316 — 2314 — 5445
$137.50
1316 — 2311 — 2315
$55.00
(lease $3.00 per mo.)
Mag. Tape
800/1600 BPI
2400' reels
$5.50
Card Cabinets
3/4 Suspension
20 drawers
$175.00

— All products fully guaranteed —
SEND ORDER TO OR CALL:
KEN BUNTJER (503) 232-7069
Automated Systems Accessories, Inc.
1637 S.E. Hawthorne Blvd.
Portland, Oregon 97214

## SYSTEM 3

IBM SYSTEM/3 MODEL 10 Available Immediately Call or write for details.

*"The small systems specialist"*
(901) 767-9130
SELL LEASE TRADE BUY
ECONOCOM, INC.
P.O. Box 171116
Memphis, Tenn.
Member Computer Dealers Association

## For Sale or Lease

Calcomp
2314
Single or Dual Density
All Deliveries
To Buy—Sell—Lease
Call collect or write to:
Comp. Sys. Graphics, Inc.
2017 W. 104th St.
Leawood, Kansas 66206
(913) 649-2190

## FOR SALE

IBM 360/65 756K
IBM 2870-1
IBM 2860-3
IBM 2365-2 (3X)
IBM 2803-2
IBM 2401-6 (10X)
with Dual Density
IBM 2703-1
Delivery: Feb. 1, 75
CW Box 4245
797 Washington St.
Newton, Mass. 02160

## Want to Purchase
## 360/40-G

with 3237, 4427, 6980/1
7920, 7520 & 1052
For 12-15-74
Call or Write:
DAVID BUCKLER
The Computer Exchange Inc.
11 Grace Ave.
Great Neck, N.Y. 11021
(516) 466-6500

LDI
Leasing Dynamics Inc.
3101 Euclid Ave.
Cleveland, Ohio
216-687-0100

## WANTED

All Unit Record Equip.

| | | |
|---|---|---|
| 026 | 514 | 519 |
| 082 | 557 | 552 |
| 029 | 083 | 085 |

IBM or Independent MA

## FOR SALE

"NEW" DATA PRODUCTS PRINTERS
DP 2470-1250 LPM $9500

IBM 1130-Bi-Sync 360/20-360/40
HIS 200/2000
UNIVAC 1108-II
MRX 40-$37,500
COMPLETE SYSTEM
MINIS/PERIPHERALS

IBM
360/20 $40,000
Disk System
1130 $39,500
Disk System
Binary — Sync.

(617) 261-1100
AMERICAN USED COMPUTER CORPORATION
P.O. Box 68, Kenmore Station, Boston, MA 02215
Member Computer Dealers Association

BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP

## 1130's
FOR SALE

All configurations available 30-60 day delivery. Call or write for a quote.

*"The small systems specialist"*

(901) 767-9130

SELL LEASE TRADE BUY

**ECONOCOM, INC.**

P.O. Box 171116
Memphis, Tenn.
Member Computer Dealers Association

## FOR SALE OR LEASE

024-$350; 026-$1300; 047-$2700; 056-$250; 077-$550; 082-$900; 083-$2300; 085-$1400; 088-$3300; 188-$16,000; 402-$1300; 403-$1400; 407-$3300; 514-$900; 519-$1300; 526-$2200; 548-$2000; 552-$1400; 557-$3700; 602-$400;

729 (6) $1600
1401-4K System-$11,000

*Member Computer Dealers Association*
THOMAS COMPUTER CORPORATION
Suite 3807A
600 N. McClurg Court
Chicago, Illinois 60611
(312) 944-1401

## INVENTORY SALE

2260 CRT's
& Remote Controllers @ 10% of IBM List.
2701-1, +3,000 w/Feat.
3815-3855, 4657, 7695
Immediate Delivery F.O.B. West Coast

Data Options Corp.
250 E. Hartsdale Ave.
Hartsdale, N.Y. 10530
(914) 723-3800
Member Computer Dealers Assoc.

## IBM
UNIT RECORD EQUIPMENT

Buy — Sell — Equity Lease
026 056 082 077 514 522 402
029 059 083 085 519 548 407
Also Other IBM Punch Card Equipment.
1620 & 1130 Components or Systems
Guaranteed Eligible for IBM M/A
Immediate Delivery
Payment Plans to fit your Budget
CALL COLLECT
CMI Corporation
23000 Mack Avenue
St. Clair Shores, Michigan 48080
(313) 774-9500
TWX 810-226-9708

## IBM 370/155
- Immediately Available
- DAT on Order
- FOR SALE
- Short Term Lease
- With or Without Memory

Contact: Larry Goichman
Alanthus Corporation
(914) 428-3703

alanthus

PROFESSIONAL COMPUTER DEALERS IN THE WEST

## SMI

SYSTEMS MARKETING, INC.
Phoenix, Arizona
Bob Russell
(602) 248-0457
*Member Computer Dealers Association*

## WANTED
BURROUGHS
L SERIES
TC 500, TC 700
NCR 31, 32, 41, 42
481-482
FRIDEN Computypers and Flexowriters
IBM 735 I/O Terminals

Call Stuart Rubenstein
**I.O.A. Data Corp.**
383 Lafayette St., N.Y. 10003
(212) 673-9300
Member Computer Dealers Assoc.

1600 Broadway
New York, New York 10019
(212) 541-6340

029 Buy·Sell 026
LEASE
029 IBM 360/20 026
SIMPLICITY COMPUTER

## FOR SALE

(3) 2401, Model 5
Tape Drives
Avail. Dec. 1-15
(2) 2nd Channels for Model 40 (#6981)
(1) 2nd Channel for Model 30 (#6961)
360/35, 32K
2415, Model 5
2415, Model 1
2520 — B2
Available Immediately
Call Ed Cherney
CMI Corporation
23000 Mack Avenue
St. Clair Shores, Mich. 48080
(313) 774-9500
TWX: 810-226-9708
Member CDA

*We buy, and sell and install*

## New and Used Computer Room Flooring

Please write or call
Raised Floor Installation
19 Sebago Street
Clifton, N.J. 07013
(201) 778-2444

WANTED
## TELETYPE®
Models 32 · 33

NATIONAL TELETYPEWRITER CORP.
207 Newtown Rd.
Plainview, N.Y. 11803
(516) 293-0444

## WHEN BUYING OR SELLING GO GREYHOUND

| FOR SALE | FOR LEASE | WANTED |
|---|---|---|
| 360/30s, 360/40s I/O sets, Tapes and Disks | 370/135 FE | All 370s, 360/65s and 360/50s |

For Excellence in Price, Quality, Experience and Assistance, Contact the office nearest you

Chicago — Pete Ahern — (312) 751-5430
Dallas — M.W. "Bill" Tucker — (214) 233-1818
Phoenix — Tom Takash — (602) 248-5978

**GREYHOUND COMPUTER CORP.**
Greyhound Tower
Phoenix, Arizona 85077

## IBM 360-65 WANTED

We desire to purchase or sublease a 768K system and a 512K system for delivery in 60 to 90 days. Interested sellers or sublessors please call or write:

Forsythe/McArthur Assoc. Inc.
919 N. Michigan Ave.
Chicago, Ill. 60611
(312) 943-3770 Telex: 25-5161

## BUY-SELL-LEASE
## WE WANT TO BUY

All model 360/20's, 360/30's 40's, 50's, and 65's. 370's and System 3's. All peripherals and unit record equipment.

FOR SALE
CALCOMP DISKS
CD-14 and 4-CD12's
360-30-64K CPU
2803-2 and 6-2401-5
2821-1 and 1403N1
CDC-6600
UNIVAC-1106
1401 SYSTEMS

Longhorn Computer
3131 Turtle Creek
Dallas, Texas 75219
(214) 522-3170

2703 (01)
1440-2
7505-10
4686
4619

FOR SALE
IBM M.A.

P.C.M. Corp.
2636 Farrington
Dallas, Tex. 75207
(214) 637-0950

## 360/20

Disk—Tape—Card
Buy—Sell—Trade—Lease
Specialists in Model 20

CMI Corporation
23000 Mack Avenue
St. Clair Shores, MI 48080
(313) 774-9500
TWX 810-226-9708
*Member Computer Dealers Assoc.*

## 360/20's
FOR SALE

All configurations available 30-60 day delivery. Call or write for a quote.

*"The small systems specialist"*

(901) 767-9130

SELL LEASE TRADE BUY

**ECONOCOM, INC.**

P.O. Box 171116
Memphis, Tenn.
Member Computer Dealers Association

OAC buys, sells and leases

UNIT RECORD EQUIPMENT
All Models Available
Refurbished
Under IBM MA

IBM COMPUTERS
All model 360/20's, 360/30's 40's, 50's, and 65's. 370's and System 3's. All peripherals.
1401 SYSTEMS

Call: Don Norris
Jack Lowey
DATA AUTOMATION CO. INC.
4858 CASH ROAD
DALLAS, TEXAS 75247
(214) 637-6570
*Member Computer Dealers Assoc.*

DPF INCORPORATED DPF INCORPORATED DPF INCORPORATED

## BUY·SELL·LEASE·TRADE

Wanted IBM System 370's
Available: IBM Systems 360/370

Special Offerings:
**2030 Print Station**
2302 Disk (Mod 4)
2303/2841 Drum, Control
2702 Communications CU
2844 Aux. Disk Control

dpf DPF INCORPORATED
141 Central Park Avenue South
Hartsdale, New York 10530
Write or call: Norman Usher, Director of Brokerage, (914) 428-5000

DPF INCORPORATED DPF INCORPORATED DPF INCORPORATED

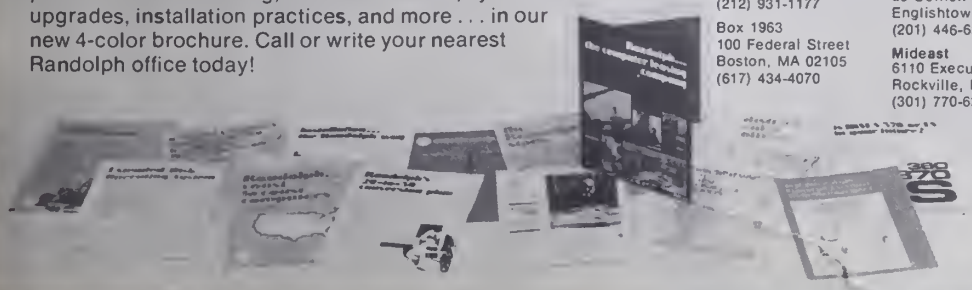
## we buy and sell

IBM Unit Record Machines
IBM 735 I/O Terminals
NCR 31 - 32 - 33 - 395 - 400,
NCR 480 - 481 - 482 - 450
BURROUGHS - L - SERIES

marion 84 Kennedy St.
Hackensack, N.J.
07601
(201) 343-4554

# Computer leasing by the book.

Find out about Randolph's approach to computer leasing . . . customer services, DOS support, systems performance monitoring, conditional sales, system upgrades, installation practices, and more . . . in our new 4-color brochure. Call or write your nearest Randolph office today!



**Northeast**
537 Steamboat Road
Greenwich, CT 06830
(203) 661-4200
(212) 931-1177

Box 1963
100 Federal Street
Boston, MA 02105
(617) 434-4070

621 Country Club Road
Avon, CT 06001
(203) 673-0435

20 Cornell Place
Englishtown, NJ 07726
(201) 446-6300

**Mideast**
6110 Executive Blvd.
Rockville, MD 20852
(301) 770-6266

**Southeast**
First National Bank of Boston
Suite 2105
260 Peachtree St. NE
Atlanta, GA 30303
(404) 688-6932

**Midwest**
8050 Hosbrook Rd.
Cincinnati, OH 45236
(513) 793-6060

625 North Michigan Ave.
Chicago, IL 60611
(312) 787-4224

**Southwest**
1545 W Mockingbird Lane
Dallas, TX 75235
(214) 637-3680

3311 Richmond, Suite 200
Houston, TX 77006
(713) 528-6679

**West**
One Wilshire Blvd.
Los Angeles, CA 90017
(213) 680-9195

525 University Ave.
Palo Alto, CA 94301
(415) 327-2780

530 "B" Street
San Diego, CA 92101
(714) 232-6401

RCC **RANDOLPH COMPUTER COMPANY**
*Division of Firstbank Financial Corporation*
A subsidiary of the First National Bank of Boston
Member of Computer Lessors Association

BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP

## SYSTEMS 70, INC.

DATA PROCESSING EQUIPMENT SPECIALISTS

2200 E. DEVON AVE., DES PLAINES, ILLINOIS 60018 (312) 827-8135

**360/370**

**buy · sell · lease · trade**

---

**IBM UNIT RECORD EQUIPMENT**

| | | | |
|---|---|---|---|
| 024 | 083 | 402 | 523 |
| 026 | 084 | 403 | 548 |
| 029 | 085 | 407 | 552 |
| 056 | 087 | 408 | 557 |
| 077 | 088 | 514 | 602 |
| 082 | 089 | 519 | 604 |

We Buy, Sell or Lease 360 - 20 System 3 1130

**IBM COMPUTERS**

Special Sale 029's All Models

Big Savings — up to 50% on Short Term Rentals

Call us for all your needs, we buy, rent and sell all types of IBM unit record equipment. Over 12 years of serving commercial and government requirements. All equipment rebuilt at our own factory and guaranteed for IBM MAINTENANCE. Contact: John Fennell V.P. for proposal. 212-689-4747 Cable: Leasatron, New York Telex: 423857 LMC U1

LMC Data, Inc. 116 East 27th Street New York, New York 10016

---

We Need: *Urgently*
1403-MOD.II
2415-MOD. V

BUY SELL LEASE

FOR BETTER VALUE LOOK TO:

Available:
1419 MOD. I
Avail. 60 days

**cac** COMPUTER ACQUISITIONS COMPANY
P.O. Box 80572 Atlanta, Ga. 30341 (404) 458-4425

---

LEASE BUY SELL

DEAL WITH PROFESSIONALS IN PLACEMENT OF

PRE-OWNED **360/370** EQUIPMENT

"The Nations Largest Wholesale Dealer"
Member Computer Dealers Association

**COMPUTER WHOLESALE CORP.**

SUITE 441-447 NATIONAL BANK OF COMMERCE (504) 581-7741
NEW ORLEANS, LA. 70112

---

ALWAYS UP & RUNNING
LEASING, BUYING, SELLING!

**WANTED**
1419's
2040G
Calcomp single & dual density drives

**SALE OR LEASE**
2030 with I/O set
CDC 6600 system
complete with I/O and disc

BOOTHE Computer • Don Bell • (415) 989-6580

---

## SYSTEM 3
FOR SALE OR LEASE
5406-B4 16K CPU
2222-2 Bi-Direct Printer
5444-2 Disk Drive
Available 60 Days
Contact: Bob Johnson
CALL: 612-546-4422

**dataserv**
equipment inc.
400 Shelard Plaza, Suite 415
Minneapolis, Minnesota 55426
Member, Computer Dealers Assoc.

---

FOR LEASE
***360/30***
***32K***
No Reasonable Offer Refused
James O. Davis
P.O. Box 9438
Shreveport, La. 71109
(318) 425-1401

---

## 360 Model 50
AVAILABLE FOR IMMEDIATE LEASE

Any core size, CPU only or complete system including I/O set
For an immediate quote call
Sid Whiting, Director of Marketing
(201) 569-3838
Diebold Computer Leasing, Inc.
177 N. Dean Street
Englewood, New Jersey 07631

---

**COMPLETE 360/30 FOR SALE**

IBM 360/30F, 1.5 MIC
Processor-64K
2821/2 Printer Control
1403/N1 Printer-1100 LPM
1442/N1 Reader/Punch
(3) 2311/1's Disk DRives
2841 Disk Control
(3) 2401/3 Tape Drives-90KB
2803/1 Tape Control
CALL OR WRITE:

Forsythe/McArthur Assoc. Inc.
919 N. Michigan Ave.
Chicago, Ill. 60611
(312) 943-3770 Telex: 25-5161

---

360/20
360/20
360/20
Sale or Lease
- C1-8K Card System
- D2-16K Disk System

CALL: 612-546-4422

**dataserv**
equipment inc.
400 Shelard Plaza, Suite 415
Minneapolis, Minnesota 55426
Member, Computer Dealers Assoc.

---

## 360 IS NOT DEAD
ENHANCE ALL 360 EQUIPMENT THROUGH UCS

UCS Upgrade Downgrade Refurbish Recondition Install Discontinue Reconfigure UCS

IBM Features and RPQ's Immediate Delivery
Price Quotes Available on Request and by Telephone
Contract R. LaRocca or S. Amoresano (201) 361-8600
TWX 710-987-7973

---

Carterfone

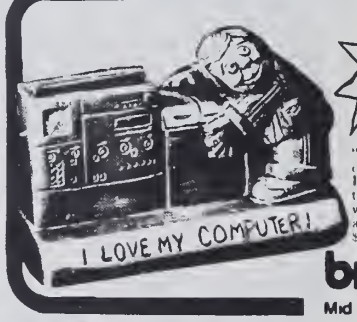
## Carterfone Needs to Buy...

your new or used
Teletypewriters: 33ASR, 33KSR, 32ASR and 32KSR.

We're paying top prices!

If you own this equipment, please contact Bud Scott immediately at (214) 350-7011.
Or write Carterfone Communications Corporation, 2639 Walnut Hill Lane, Dallas, Texas 75229.

---




for CHRISTMAS !

"I Love My Computer" Statue is a paperweight-conversation piece for any desk or computer room. Item is made for all computer users, and symbolizes the fact that EDP professionals spend a lot of time with their computer. Gold-finished plaster statues are priced at $4.95 each on quantities of 100 or less, $3.95 each in quantities over 100

**brian productions**
Mid City P.O. Box 101 Dayton, Ohio 45402

---

## 360 370

BUY SELL TRADE LEASE

Member Computer Dealers Association

We're the one with the finest reputation in the industry for on-time delivery at fair market prices. We're the one that has sold and leased over $100,000,000 in used IBM COMPUTER EQUIPMENT to hundreds of users large and small. We're the one that's publicly held and financially stable. We're the biggest in the industry; We got there because we earn our business by providing expertise, professionalism, and integrity. Call us collect or write.

AVAILABLE EQUIPMENT

370/155 DAT box avail.
360/50 lease/purchase
360/65 lease with option
I/O sets for sale

BROKER INQUIRES INVITED

Comdisco Inc.
Home Office
2200 E. Devon Ave. Des Plaines, Ill. 60018
312/297-3640 TWX-910-233-2478

Eastern Office
2777 Summer St. Stamford, Conn. 06905
203/359-4814 TWX-910-233-2478

COMDISCO

---

## -SALE- 360/65 -LEASE-

SYSTEMS AVAILABLE
1130
360/20
360/30
360/50
370/155

**ECONOCOM, INC.**
Subsidiary of Cook Industries Inc.
855 Ridge Lake Blvd.
P.O. Box 171116
Memphis, Tennessee 38117
(901) 767-9130

I/O AVAILABLE
2401-5's
2401-6's
2501-B2
2520-B2
I/O Sets

"MEMBER COMPUTER DEALERS ASSOCIATION"

---

## GET IT TOGETHER

SOFTWARE SUPPORT WITH YOUR COMPUTER LEASE FROM THE WORLD'S LEADING INDEPENDENT SOFTWARE COMPANY.

ALL AVAILABLE IMMEDIATELY WITH I/O SET:

• 360/75J • 360/40H • 360/50 I

CALL STEVE ELIAS AT (213) 678-0311 OR WRITE TO:

**CSC**
COMPUTER SCIENCES CORPORATION
650 N. SEPULVEDA BOULEVARD
LOS ANGELES, CALIFORNIA 90245
Major Offices and Facilities Throughout the World

BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP

370/135 144K
370/135 512K
360/30 65K – Loaded
1130 – Comm. feature, 1132-1, 1442-7
CDC 2314
2415 – MODELS 1, 2 and 4
I/O Set – 1403-N1, 2540, 2821
UNIVAC 9300 – Any Size
UNIVAC TAPES AND DISCS.

**L&A Computer Industries, Inc.**
Fox Hill Office Park • 10955 Granada
Overland Park, Ks. 66211 • (913) 381-7272

SALE OR LEASE BY OWNER
**3155-PROCESSOR**
WITH OR WITHOUT
**VIRTUAL OPTION**
AVAIL. JAN. 1975 - IBM OR AMS MEMORY

THOMAS COMPUTER CORPORATION
600 MC CLURG COURT SUITE 3807
CHICAGO, ILLINOIS 60611 (312) 944-1401

**370/165 • 370/155 • 370/145**
**3830/3330 • 3360**

We have immediate requirements for both purchase and lease of 370/165, 155, and 145 CPU's. 165 wanted for November/December delivery; 145's and 155's for delivery as soon as possible.

We also have 165's for sale or lease beginning December 1974. 155's and 145's for sale and lease are available for November and later delivery.

3830-1, 3830-2, 3330-1, and 3330-11 discs and controllers, as well as 3360-3 and -5 Storage Units, are available for immediate delivery.

Call IPS for all your medium- and large-scale systems requirements.

IPS
IPS COMPUTER MARKETING CORP.
467 Sylvan Avenue,
Englewood Cliffs,
New Jersey 07632
(201) 871-4200,
TWX (710) 991-9677
"MEMBER COMPUTER DEALERS ASSOCIATION"

TLW

**360-370 market place**
BUY – SELL – LEASE

**TLW COMPUTER INDUSTRIES INC.**

ATLANTA: 3570 American Drive, Atlanta, Ga. 30341
404-451-1895 TWX 810-757-3654
CHICAGO: 312-295-2030
SAN FRANCISCO: 408-249-0110
LOS ANGELES: 213-373-6825

**WANTED TO BUY**
Univac/RCA
70/432 – 2 tape drives
70/590 disc drives
(memorex)
9300 – 8 or 16 K
6C – 9 Tk tapes
(216) 526-2080

*SALE Or LEASE*
*Immed. Available*
**360/40G 128K**
2 Channels Stor. Protect
**360/30 16K CPU**
1.5 MS, 2 Channels, Loaded
**360/20 D2 16K**
with 2203 Printer
2560 MFCM
All Models
Tape & Disk Drives
(212) 673-9300
DATA CORP
383 Lafayette St.
New York, N.Y. 10003
*Member Computer Dealers Assoc.*

***FOR SALE***
GENERAL ELECTRIC TERMINET 300-118 print columns, pin feed, paper tape reader and punch, numeric cluster. Purchase new May 1973. Wagstaff Engineering Inc.
Box 186
Spokane, WA 99211
(509) 535-3508

**360/370**
**System/3**
CPUS & PERIPHERALS
Buy . Sell
Lease . Trade
CALL: 612-546-4422
dataserv
equipment inc.
400 Shelard Plaza, Suite 415
Minneapolis, Minnesota 55426
Member, Computer Dealers Assoc.

**FOR SALE**
"NEW" DATA PRODUCTS PRINTERS
DP 2470-1250 LPM $9500
IBM 1130-Bi-Sync 360/20-360/40
HIS 200/2000
UNIVAC 1108-II
MRX 40-$37,500
COMPLETE SYSTEM
MINIS/PERIPHERALS
HONEYWELL
Systems or Units
201-2 Tape System
1200 System
2200 System
200 RJE Terminals $7500
8K CPU, 400 LPM,
800 CPM
FOR LEASE
2050A System
(617) 261-1100
AMERICAN USED COMPUTER CORPORATION
P.O. Box 68, Kenmore Station, Boston, MA 02215
Member Computer Dealers Association

**360 Model 40**
AVAILABLE FOR IMMEDIATE LEASE
Any core size, CPU only or complete system including I/O set
For an immediate quote call
Sid Whiting, Director of Marketing
(201) 569-3838
Diebold Computer Leasing, Inc.
177 N. Dean Street
Englewood, New Jersey 07631

**PAYMASTER II**
the finest comprehensive payroll system available today, features.
- *exception basis input*
- *multiple pay frequencies*
- *hourly/salary/piecework/commissions*
- *labor & tax distribution/analysis*
- *personnel system*
- *job costing*
- *multiple State taxes/employee*
- *complete tax maintenance*
- *monthly accrual/reversal*
- *powerful "report writer"*
- *Workman's Compensation*
- *check reconciliation*
- *S.U.I./F.U.I.*
- *ANS COBOL*

IBM DOS/VS & O/S; Honeywell MSR & O/S 2000
"MONTHLY LICENSE-TO-USE" or "PURCHASE"
*Also available: Accounts Payable & Canadian systems*
COMTECH
Comtech U.S.A. Inc., Box 784, Reston, Virginia 22070 (703) 471-7141

**ITEL is selling:**
- 360/30E
- 365/50I
- DUPLEX 360/671H w/2365's
- 370/145H
- 370/145 J2
- 370/155I
- 145 MEMORY
- 155 IBM MEMORY
- 155 AMS MEMORY
- 2314's (MOD 1's & A1's)
- 2816
- High Speed I/O Sets
- 370/155J – SALE OR LEASE

ITEL is buying 135's, 145's, 155's and 165's.

**Call the Computer Sales Corporation at ITEL.**
In New York, call Dick Absher at (212) 486-9170.
In San Francisco, call Fred Hegeman at (415) 983-0410
or Dick Hynes at (415) 983-0278
In Dallas, call Tom Brown at (214) 620-2787.
ITEL CORPORATION
One Embarcadero Center, San Francisco, California 94111

BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | BUY SELL SWAP | TIME FOR SALE

## SELL or LEASE

| | |
|---|---|
| 2401-3 7 track | $1,100 |
| 2804-2 | $17,000 |
| 2816 | $2,500 |

BAY AREA COMPUTER CORPORATION
call: Jerry Olson
415-254-3976
Suite 61-B
Avenida de Orinda Bldg
Orinda, Calif. 94563
IBM EQUIPMENT SPECIALISTS IN THE WEST

## AVAILABLE

145-H with features 2001, 6982, 6983, 7855, 8810; and 3415-1 Console Available for sale or lease Jan. 1, 1975
370/J2 Available for sale or lease March 1, 1975

ITEL Computer Sales Corp.
Tom Brown (214) 620-2787
Dick Hynes (415) 983-0278
Dick Absher (212) 486-9170
Fred Hegeman (415) 983-0410

## TERMINALS & PRINTERS

You win . . . We lose . . . We have more DG Memories & Centronics Printers than we need. We are forced to sacrifice them for cash!

Contact:
CAPIDYNE CORP.
100 Commerce Way
Woburn, MA 01801
(617) 658-4158

## IBM 1401 WITH 1311 DISK

For Sale
*Also 729 Tape Drives*

D.P. Equipment Marketing Corp.
260 W. Broadway, N.Y. N.Y.
CALL (212) 925-7737 Ext. 1

FOR LEASE ONLY
Available in December
370/145 MODEL I
FOR SALE OR LEASE
—NOW—
4 Telex Tape Drives and Controllers with dual density (equivalent to IBM 2401 Mod 5)
CROSS COMPUTER CORP.
(516) 487-9812
505 Northern Blvd.
Great Neck, N.Y. 11021
TELEX 12028

## MOVING?

Please notify *Computerworld* at least four weeks in advance. When writing about your subscription, please enclose a recent mailing label. The code line on top may not mean much to you, but it is the only way we have of quickly identifying your records. If you are receiving duplicate copies, please send both labels.

797 Washington Street
Newton, Massachusetts 02160

## GENERAL AUTOMATION 18/30

- 32 K CPU, 600 L.P.M. printer
- 10 Million bytes of disk storage
- 9 track 800 BPI magnetic tape
- 1000 CPM card reader

Asking $70,000.
Available F.O.B., Jacksonville, Fla.
Call Mr. Rick Tighe
(904) 396-2011

## 2-2319 (A01) FOR SALE IBM M.A.

P.C.M. Corp.
2636 Farrington
Dallas, Tex. 75207
(214) 637-0950

## S/3 - HALF PRICE - S/3

8 — 5445 Disc Packs
17 — 5444 Disc Packs
3 — Disc & Card Storage Cabinets
3 — Key Punch Desks
All equipment is just 8 months old.
Call: Monroe Group, Inc.
1430 Broadway
New York, N.Y.
Mr. Shep Brozman — Pres.

## 360/30 (64K)

Will sell or lease this system which includes decimal arithmetic, external interrupt, 1400 compat, storage protection, interval timer, 1st selector channel, programmed mode switch, 1051 control, and 1052 console printer.
CONTACT
Gordon Johnson
PEOPLES TRUST BANK
913 S. Calhoun Street
Fort Wayne, Ind. 46802
(219) 743-0383

## FOR SALE

Sycor Model 340 Intelligent Communications Terminal. Sixteen months old. Under maintenance and like new. Easy to program. CRT for visual verification and correction of keyed data. Equipped with nine track mag tape drive and cassette tapes. Priced to sell.
Medical Datamation, Inc.
208 Union Bank Bldg.
Bellevue, OH 44811
(419) 483-6060

## IBM 2314/A1 SALE

2314/A1-5 spindle
and
2314/A1-9 spindle
Avail. Early Dec. 1974
Lease Plan Available
Under IBM Maintenance
Call or Write:
Forsythe/McArthur Assoc. Inc.
919 N. Michigan Ave.
Chicago, Ill. 60611
(312) 943-3770 Telex: 25-5161

WANTED
## DISK PACKS & CARTRIDGES

1316, 2316, 3336, 955, 5440 etc. We can purchase outright or exchange one type for another.
Used Computers, Inc.
7 Woodside Ave.
Berwyn, Pa. 19312
(215) 647-1881

## MINI-COMPUTERS

Buying? Selling? Let us do the work for you and save you time and money.

### AVAILABLE NOW:

-Data Products 2440 Printer ($7,900)
-Nova 2, Jumbo 1200, 1220, 820 ($6,000 for 16K) Supernova, 4001-std ($1,900)
-PDP 11/05, 11/20
-Wange 720 Systems
-HIS 316
And many others.

### WANTED TO BUY:

-RK11, RK05, TM11, TU10, Nova 1200, DCC D116, PDP 8E, 11/35, 11/45.
MINI — COMPUTER EXCHANGE
(408) 733-4400
TWX 910-339-9272

## MAGNETIC TAPE

| 1600 BPI | recertified | 800 BPI uncertified |
|---|---|---|
| 2400 | $6.00 | $3.50 |
| 1200 | 5.00 | 3.00 |
| seals | thinline | thickline |
| IBM | Memorex | Scotch |

released from GEOPHYSICAL Archives not work tapes
(713) 772-5557 C.A.R.D.
7575 Bellaire Blvd.
Houston, Texas 77036

## UNIVAC 1710 PRINTING KEYPUNCHES

For Sale
Or Lease
Available Immediately
Electromec
3520 De La Cruz Blvd.
Santa Clara, CA 95050
Contact Mr. Young
(408) 244-6460

## USED EQUIPMENT FOR SALE

Beta COM 600 COM Recorder
7 and 9 track; 556/800 BPI; 16mm and 35mm with extra set 400 foot magazines for each; memory expansion to 8K. Price $23,000.
Ampex TM16 Magnetic Tape Unit
Multi-format, tri-density, 120KC. Price $5,000.
Contact: R.W. Reinholdt
SynerGraphics
P.O. Box 7958
San Francisco, CA 94120
(415) 983-5200

## IBM 2314-1 2-CHANNEL SWITCH

Available for lease, lease/purchase or sale.
For information ask for Dave Buckler
The Computer Exchange Inc.
11 Grace Ave.
Great Neck, N.Y. 11021
(516) 466-6500

## FOR SALE

HONEYWELL 200 SYSTEM SERIES 115 CONSISTING OF

116-3 Central Processor
4 172 Disk Drives
204-B-1 magnetic Tape Units
2 204-B-2 Magnetic Tape Units
122-3 Line Printer with soundproofing
214-2 Card Reader/Punch

Available 1-1-75, Contact:
L.M. Vaughan or W.C. Clingman
P.O. Box 19097
Houston, Texas 77024
(713) 467-6000

## 1401

Card, Tape & Disk Systems Available
CMI Corporation
23000 Mack Avenue
St. Clair Shores, MI 48080
(313) 774-9500
TWX 810-226-9708
*Member Computer Dealers Assoc.*

THIS COSTS YOU MONEY

DOLLARS IN CAPITAL EQUIPMENT NOT IN USE.
TURN YOUR LOSS INTO USABLE DOLLARS.
WE WILL BUY OR RECONDITION YOUR TELETYPE
MODELS: 28-32-33-35-38
A.D.M. COMMUNICATIONS
1265 Simpson Way
Escondido, Calif. 92025
(714) 747-0374

## UNIVAC

VI-C TAPE DRIVES FOR 9200/9300
34KB 2 DRIVES AND CONTROLLER
SELL OR LEASE
ONE 0858-99 SUBSYSTEM
TWO 0858-14 SLAVES
AVAILABLE NOW
(216) 464-3881

## Time Wanted

## WANTED Computer Time

Software companies are looking for 360/370 time in exchange for software. Computer must be in Orange County, Calif.
Jay Hanson . . . .
(714) 581-0640

## Time for Sale

## NEW JERSEY

## I.B.M. - 360-30

All shifts available
65K, 5 - 2401 Mod-2 9 track
2 - 2401 Mod-2 7 track
4 - 2311, 1403-N1, 2540
Prices start at $35.00 per hour.
We also offer complete processing services. Configuration can be modified to accommodate any 360 computer user. We have on-site CE's.
UCS Computer Centers
Route 80
Dover, N.J. 07885
Contact Bill Kersey at
(201) 361-8600 or
Sam Amoresano at
(201) 361-8601

## NEW JERSEY

## TIME FOR SALE

Block or Remote
Reasonable Rates
370-135/256k
6-3330 DASD
4-3400 Tapes
1403N1/3505/3525
Cherry Hill, N.J. Area
Write CW Box 4244
797 Washington St.
Newton, Mass. 02160

## ILLINOIS

## IBM 360/370 USERS

COMPUTER TIME AVAILABLE

### 370/158

2 meg, 3330 (32m), 2314 (16m), 12 3420-5 d.d. tape OS/VS2, RJE, TSO, ATS, DOS emul.
24 Hours — 7 Days

### 370/155

2 meg, 3330 (16m), 2314 (8m), 12 3420-5 d.d tape

### 370/135

240K, 3330 (4m), 2314 (8m), 6 3420-5 d.d. tape

### 370/135

144K, 2314 (8m), 6 3420-5 d.d. tape

FOR FURTHER INFORMATION
JIM WHITELEY
(312) 346-1331
computerresearch company
200 N. Michigan Avenue
Chicago, Ill. 60601
Largest Computer Time Sales Co.

## 370/158

Virtual OS-MVT-HASP DOS-VS1-VS2-CMS

| | | |
|---|---|---|
| HF/II | APT | MPSX |
| ICES | BLISS | CROSSTABS |
| PICS | PAYROLL | SSP |
| MPS | PLAN | SAS |
| | BMD | PROJECT II |

PAYROLL
INVENTORY CONTROL
ACCOUNTS PAYABLE
ACCOUNTS RECEIVABLE
GENERAL LEDGER

Order Entry Systems
Hyperfaster, Amigos

General Purpose Simulation System
Continuous System Modeling Program
Urban Transportation
Planning System 360

TIME SHARING
REMOTE BATCH
BLOCK TIME

Your Programs or Ours

STAT-TAB
A Division of Statistical Tabulating Corp
Chicago, Illinois
(312) 346-7300
Jim Hancock

## Subscribe to Computerworld

## TIME FOR SALE

### ILLINOIS

FULL SHIFT A DAY
370/155 2 MEG
3330's AND 2314's
3211 and 1403
HANDS ON OR RJE
OS/DOS

370/135
3330's and 2314
OS/DOS VS
FULL SHIFT

OVER 200 SYSTEMS TO PICK FROM

CALL FRANK ORLANDO, JR.
(312) 346-1331
200 N. MICHIGAN AVE.
CHICAGO, ILL. 60601

---

*IBM 370/158*

2 MEG, OS/MVT, HASP
TSO, RJE, BATCH
26-3330's; 21-3470's
4-1403 - N1's
Also, Xerox 1200 processing

*EXCELLENT TURNAROUND*
*COMPETITIVE RATES*

Jewel-Oak Brook
Data Center
2107 Swift Drive
Oak Brook, Ill. 60521
(312) 887-7700

### MINNESOTA

St. Paul

370-135

96K
4 3330 1 2501
3 3420-3 1 1442
1 1403 N1
$50 per Hour-All Shifts
Contact: Mr. Winter
(612) 227-8001

### WASHINGTON, D.C.

Litton

IBM-370/158 SYSTEM

VS2 - HASP - TSO

DOS EMULATION

2-HOURS TURNAROUND

ALL SYSTEMS AVAILABLE
24-HOURS PER DAY

LITTON RESTON COMPUTER CENTER
1831 Michael Faraday Drive
Reston, VA 22090

703 471-9200

## TIME FOR SALE

### N. & S. CAROLINA

IBM 360/370 Users
Computer Time Available

370/158 - DOS & OS Time
Local & Remote Batch
On-Line Interactive
24 Hours - 7 Days
Network Computing Corp.
4827 Park Road
Charlotte, N.C. 28209
(704) 525-8810

### NEW YORK

XEROX 1200 SERVICES

Mag tape to high Quality 8-1/2 x 11 hard copy.
If you produce multi-copy reports or are currently reducing your output — there is a better way.
Call Us Today
(212) 869-0640
COMVESTRIX CORPORATION
1500 Broadway
New York, N.Y. 10030

---

COMPUTER TIME
ALL SYSTEMS
360/30 65K
Midtown Location
From $25 per hour
The Service Bureau that gives a damn!
ANCHOR COMPUTER, INC.
(516) 785-1788 (24 Hours)
(212) 697-4660

---

370/158
VS2-HASP/RJE, TSO
DOS Emulation
Disks-(18) 3330, (3) 2319
Tapes-(16) 3420 mod. 7
Printers-(5) 1403, (1) 3211
Excellent Technical Support
Very attractive rates on all shifts
Contact: Stu Kerievsky
(212) 564-3030
Datamor
132 West 31 St.
New York, N.Y. 10001

---

I.B.M. - 360-30

All Shifts 65K, 4-2401 MOD-2, 3-2311, 1403-N1, 2540, 1401 Compatibility
From $35.00/Hour
Restaurant Associates Ind.
1540 Broadway bet. 45 & 46th St.
New York, New York 10036
Contact:
Al Palmo at (212) 974-4966
Elliott Musikoff at (212) 974-4967

---

Thomas National, Inc.
1775 Broadway, N.Y.C.
370/158
DATACENTER
OS-VS — RJE
And Other Communications
Automated Photo Composition
DOS Emulation
3330's and 2314's
Systems and Programming Support
Data Entry Services
Convenient 57th St. Location
Open 24 Hours Per Day
Call (212) 765-8500

## TIME FOR SALE

### NEW YORK

COMPUTER TIME
370/135 144K
DISK-TAPE
1400 COMPATIBILITY
RATES AS LOW AS $30 PER HOUR
Includes Operator and Technical support.

LOCATED LONG ISLAND CITY, NEW YORK, JUST MINUTES FROM MIDTOWN.

CALL:
MR. ALEXANDER
(212) 786-0620

---

Software for Sale

OS/MFT?
ON A NOVA?

Not quite, but Capidyne's OS is a Large Scale, Multi-tasking System which runs on any Nova type mini, 12K & up.

- 4 years of Field Operation
- Over 50 Peripherals supported
- True Multi-tasking with Variable Length Partitions
- Sorting Function
- Output Device Spooling
- Multiple File Types: PAM, VAM, VIAM & INDEXED
- Additional features; i.e., Cobol Pictures, Fortran IV, Language Processors.

For further information contact
CAPIDYNE CORP.
100 Commerce Way
Woburn, MA 01801
(617) 658-4158

---

*McCORMACK & DODGE CORPORATION*

HAS
DEVELOPED
MARKETED
MAINTAINED

Accounting-orienteo software products over the past five years.
Over 400 companies in the U.S. are using one or more of the following:

Fixed Asset Analysis & Accounting System
Accounts Receivable System
Investment Analysis System
Accounts Payable System

*McCORMACK & DODGE CORPORATION*

One Wells Avenue
Newton, Mass. 02159
(617) 965-3750

## SOFTWARE FOR SALE

### PAYROLL PERSONNEL

—All COBOL-48K or above
—Variable of fixed input
—Disk or tape-IBM or others
—State and local taxes

30 Day Free Trial
50+ Users • Only $1960

- Mail-All List/Ltr Sys ....$660
- Super/Cobol Prog. Gen. ..$960
- PLS-Prog. Lib. Sys. ....$2000
- TIM-Tape Inven. Mgr. ...$750
- Super/Doc Doc. Sys. ...$2960
- Call (213) 763-5144 for a software catalogue . . .

Occidental Computer Systems, Inc.
11311 Camarillo Street
North Hollywood, Calif. 91602

---

PAYROLL PERSONNEL
XXX
ACCOUNTS PAYABLE
XXX

Modular, flexible systems with multi-company capabilities. Presently functioning for a variety of users. All programs written in COBOL.

ARGONAUT INFORMATION SYSTEMS, INC.
2140 Shattuck Ave.
#203
Berkeley, CA. 94704
(415) 845-7991

---

AUTOCODER & SPS TRANSLATED to BAL & PL/1

THE TOTALTRAN SYSTEM
1400 Object to clean source decompilation
1400 Clean source to BAL. and to PL/1 translation
Contact: W. Small, President

CPU MANAGEMENT ADVISORY CORP.
853 Broadway, N.Y. 10003
(212) 777-7722

---

software for sale

1401 SIMULATION on IBM SYSTEM/3

Execute existing 1401 4K Object programs on an IBM System/3 Model 10

Features:
- All standard instructions
- 4K of core storage
- Advanced programming
- Multiply/divide
- Expanded print edit
- Punch feed read
- Sense switches

We have installed 19 System/3s, replacing 19 1401s in steel plants nationwide, using this valuable package.

Contact: W. J. Landis
Bethlehem Steel Corporation
Bethlehem, PA 18016
(215) 694-6216

---

ACCOUNTING SYSTEMS

PAYROLL
GENERAL LEDGER
ACCOUNTS PAYABLE
INVENTORY
ACCOUNTS RECEIVABLE

IBM SYSTEM/3 USERS
IBM 360-70 USERS
RPG II BAL COBOL

Certified Software Products, Inc.
3140 Harbor Lane North
Minneapolis, Minn 55441
612-546-6919

## SOFTWARE FOR SALE

### HOSPITAL SOFTWARE PACKAGES

Over 50 hospitals currently use these systems. Written in ANSI COBOL. Buy proprietary rights or use timesharing. Fully documented and operational.

- General Ledger — Financial Statements
- Cost Allocation — Any basis Multiple steps
- Trend Analysis — Unit Costing
- Budget Forecasting and Modeling
- Accounts Payable
- Inventory Control
- Patient Billing — Accounts Receivable
- Admission-Discharge-Transfer
- Payroll — Personnel
- Nurse Scheduling
- Unit Dosage
- Fixed Asset — Preventive Maintenance
- Professional Fee Billing

HSA
Hospital Financial Services, Inc.
359 San Miguel Drive, Suite 202
Newport Beach, Calif. 92660
(714) 644-6411
or
120 East Ogden Avenue
Hindsdale, Ill. 60521

---

LOOKING FOR SOFTWARE?

Free Software Search and Package Appraisal Service

We help you locate the software packages which best meet your needs. There is no charge to you for this service. Write or call: Tom Weaver.

Systems Exchange Co.
1034 Colorado Ave.
Palo Alto, Calif. 94303
(415) 328-5490

Software Suppliers
We are currently looking for:
- 1410 Autocoder to Cobol conversion
- Accounting in Fortran for 32K Mini
- Installment loan in Cobol for IBM System 3/10 24K

SYSX

---

Looking for accounting systems? Talk to the leaders.

Over 1000 of them use ours.

Infonational offers a complete system of accounting software or computer services. **General Ledger, Accounts Receivable, Accounts Payable, Fixed Assets, etc.** Programs that can be used separately or as a totally integrated system.

Check the features of our proven systems — professional documentation, on-site training programs, our 99 year unconditional warranty. See why our systems have been chosen by over 1000 of the world's leading firms. Including many banks and processing centers.

Call or write for our literature and the office nearest you. Ask to see our client list so you can find out about us for yourself.

**Infonational World Headquarters, Dept. 102, P. O. Box 82477, San Diego, CA 92138 or call (714) 560-7070.**

INFONATIONAL
talk to the leaders

# Softening Mini Market Affecting Pertec

By Marvin Smalheiser
CW West Coast Bureau

LOS ANGELES – A softening in the minicomputer market has caused a slowdown in orders for Pertec Corp.'s Peripheral Equipment Division (PED), but its Business Systems Division (BSD) is still going strong.

Stockholders at the annual meeting were told by Ryal R. Poppa, Pertec's president, that the PED has laid off 30 full-time employees as a result of the slowdown.

But the BSD is still working hard at expanding its manufacturing capability for what Poppa described as the largest backlog in the division's history, due in large part to orders for the company's shared-processor key-to-disk system.

When asked about the company's flexible disk drive, Poppa said, however, that it has not yet been as successful as anticipated.

Forecasted revenues of $1 million for fiscal 1975 from the drive have been revised down to $700,000, he added.

"We need more time. It was not the market for 1974. We believe the [flexible disk drive] market will begin in 1975 and there will be a major surge in 1976," he said.

The economy should remain sluggish for about six months and then start a slow pullout, Poppa added.

He does not look for a significant fallout of companies during the current recession, although "a number of smaller companies could get into trouble."

Revenues for Pertec's first quarter were reported at $10 million, a 27% increase over $7.9 million for the same period last year.

Net income was $341,000 or 11 cents a share compared with $458,000 or 15 cents a share in the year-ago period.

"We had expected consolidated profits to be slim for the first quarter in view of heavy costs associated with a dramatically increasing manufacturing requirement at our BSD," Poppa said.

"Our PED however, had an excellent first quarter and as a result consolidated profits were 2 cents per share more than anticipated."

Poppa said that overall the company is expecting to have a "very profitable year."



# Earnings Drop as Predicted at CA For First Decline in 13 Quarters

IRVINE, Calif. – As predicted, Computer Automation, Inc. showed its first earnings decline in 13 quarters with earnings of $195,288 or 12 cents a share.

This represents a 51% drop from the $396,780 or 24 cents a share in the first quarter of fiscal 1974.

However, sales for the quarter rose 32% to $5.1 million from $3.9 million in the year-ago period.

David H. Methvin, president, attributed the earnings drop to lower than expected shipments of the firm's minicomputers, brought on by the tight money situation, "uncertain economic conditions" and the company's own restrictions on customer credit, which have had the short-term effect of delaying some shipments.

Also, R&D expenses were also higher than normal during the quarter, ranging above the firm's traditional outlay of about 10% of sales.

In the past two months, expenses have been brought in line with sales through a reduction in the workforce, from about 440 to about 360 people.

Computer Automation cut short-term bank debt by about $1 million during the last quarter, and further reductions are planned.

# Memorex Makes Financial Gains

SANTA CLARA, Calif. – Although results for the third quarter at Memorex, Inc. were "not satisfactory," significant gains were made in the firm's overall financial condition, Robert C. Wilson, Memorex's president, said.

A $900,000 credit stemming from debt restructuring reduced Memorex's third-quarter loss to $143,000 or 3 cents a share compared with $3.9 million or 89 cents a share in the year-ago period.

Revenues rose 30% to $56.2 million from $43.2 million in the same 1973 period. Most of the increase was from sales, which rose to $31.1 million from $19.2 million, rather than rental and service revenues.

Wilson pointed out indebtedness to senior lenders was reduced by more than $56.7 million during the quarter.

# *Data 100, Odec Change Terms of Acquisition*

MINNEAPOLIS – Data 100 Corp. has restructured terms of its agreement to acquire Odec, Inc., maker of impact line printers, according to Edward D. Orenstein, president of Data 100 and Alfred J. Petteruti, chairman of Odec.

Under the new proposal, Data 100 will issue approximately 41,000 shares of preferred stock for all of the 1.9 million outstanding common shares of Odec instead of an exchange of common shares as previously announced.

The preferred shares will be redeemable for cash or Data 100 common stock on a formula basis.

The merger will be accounted for as a purchase rather than on a pooling-of-interests basis as previously announced. The proposed transaction, which is subject to the approval of Odec's 650 shareholders, is planned to be completed by the year's end.

# Earnings Reports

**AMERICAN MICROSYSTEMS**
Three Months Ended Sept. 28

| | 1974 | a1973 |
|---|---|---|
| Shr Ernd | $.20 | $.68 |
| Revenue | 17,685,000 | 15,465,000 |
| Earnings | 457,000 | 1,517,000 |
| 9 Mo Shr | 1.45 | 1.54 |
| Revenue | 56,959,000 | 40,972,000 |
| Earnings | 3,244,000 | 3,418,000 |

a-Restated to apply effective tax rate for the year to interim quarters.

**SYCOR**
Three Months Ended Sept. 30

| | 1974 | 1973 |
|---|---|---|
| Shr Ernd | $.54 | $.47 |
| Revenue | 10,337,600 | 8,652,100 |
| Tax Cred | 585,000 | 546,700 |
| Earnings | 1,497,800 | 1,285,200 |
| 9 Mo Shr | 1.33 | .51 |
| Revenue | 29,466,100 | 22,880,900 |
| Spec Chg | ..... | a2,060,000 |
| Tax Cred | 1,450,000 | 1,441,700 |
| Earnings | 3,695,600 | 1,308,000 |

**HONEYWELL**
Three Months Ended Sept. 30

| | 1974 (000) | 1973 -(000) |
|---|---|---|
| Shr Ernd | $.67 | $1.17 |
| Revenue | 621,233 | 587,521 |
| Spec Cred | 569 | 774 |
| Earnings | 12,980 | 22,278 |
| 9 Mo Shr | 2.81 | 3.16 |
| Revenue | 1,865,364 | 1,691,381 |
| Spec Cred | 2,402 | 2,835 |
| Earnings | 53,977 | 60,015 |

**IBM**
Three Months Ended Sept. 30

| | 1974 (000) | 1973 (000) |
|---|---|---|
| Shr Ernd | $3.23 | $2.81 |
| Revenue | 3,125,242 | 2,755,850 |
| Earnings | 477,273 | 409,895 |
| 9 Mo Shr | 9.45 | 7.59 |
| Revenue | 9,387,021 | 7,753,026 |
| Earnings | 1,391,101 | 1,106,745 |

**BARRY WRIGHT**
Three Months Ended Sept. 30

| | 1974 | 1973 |
|---|---|---|
| Shr Ernd | $.29 | $.23 |
| Revenue | 10,934,665 | 9,183,936 |
| Earnings | 479,943 | 375,239 |
| 9 Mo Shr | .83 | .77 |
| Revenue | 33,686,169 | 28,126,938 |
| Spec Cred | ..... | a64,033 |
| Earnings | 1,357,461 | 1,263,736 |

a-From the sale of land.

**BURROUGHS**
Three Months Ended Sept. 30

| | 1974 (000) | 1973 (000) |
|---|---|---|
| Shr Ernd | $.66 | a$.55 |
| Revenue | 346,710 | 302,973 |
| Earnings | 25,815 | 21,242 |
| 9 Mo Shr | 2.08 | a1.72 |
| Revenue | 1,048,546 | 891,727 |
| Spec Cred | ..... | b2,475 |
| Earnings | 81,121 | 66,174 |

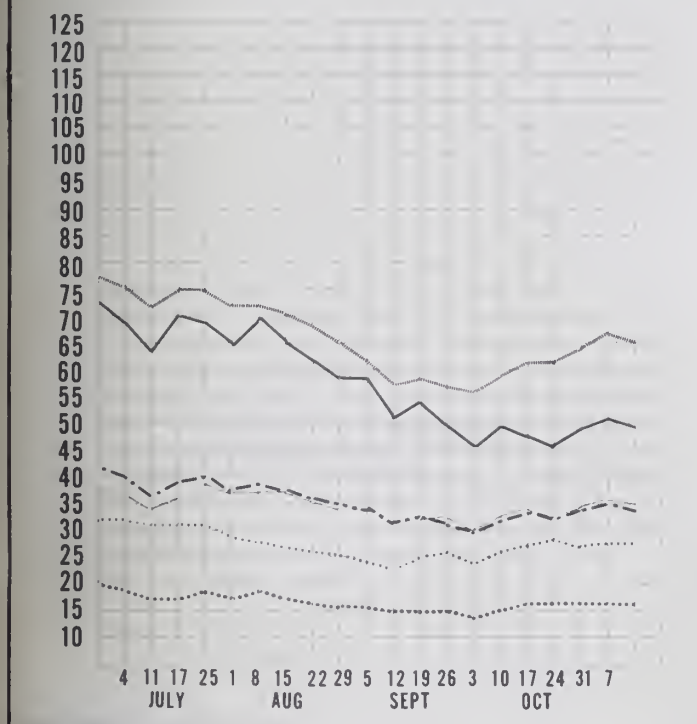
a-Reflects a two-for-one stock split in April 1974. b-Gain from the sale of securities.

**TRW**
Three Months Ended Sept. 30

| | 1974 (000) | 1973 (000) |
|---|---|---|
| aShr Ernd | $.79 | $.69 |
| Revenue | 630,200 | 538,100 |
| Earnings | 28,200 | 23,600 |
| a9 Mo Shr | 2.11 | 2.10 |
| Revenue | 1,838,700 | 1,595,100 |
| Earnings | 75,000 | 72,200 |

a-Fully diluted.

## COMPUTERWORLD Computer Stocks Trading Indexes




# Computerworld Sales Offices

**Vice President — Marketing**
*Neal Wilder*
**Sales Administrator:**
*Dottie Travis*
COMPUTERWORLD
797 Washington Street
Newton, Mass. 02160
Phone: (617) 965-5800
Telex: USA-92-2529

**Northern Regional Manager**
*Robert Ziegel*
**Account Manager**
*Mike Burman*
COMPUTERWORLD
797 Washington Street
Newton, Mass. 02160
Phone: (617) 965-5800
Telex: USA-92-2529

**Eastern Regional Manager**
*Donald E. Fagan*
**Account Manager**
*Frank Gallo*
COMPUTERWORLD
2125 Center Avenue
Fort Lee, N.J. 07024
Phone: (201) 461-2575

**Los Angeles Area:**
*Bob Byrne*
Robert Byrne & Assoc.
1541 Westwood Blvd.
Los Angeles, Calif. 90024
Phone: (213) 477-4208

**San Francisco Area:**
*Bill Healey*
Thompson/Healey Assoc.
1111 Hearst Bldg.
San Francisco, Calif. 94103
Phone: (415) 362-8547

**Japan:**
*Ken Suzuki*
General Manager
Dempa/Computerworld
1-11-15 Higashi Gotanda
Shinagawa-ku, Tokyo 141
Phone: (03) 445-6101
Telex: Japan-26792

**United Kingdom:**
*Michael Young*
c/o IDC Europa Ltd.
140-146 Camden Street
London NW1 9PF, England
Phone: (01) 485-2248
Telex: UK-26-47-37

**West Germany:**
*Otmar Weber*
Computerworld GmbH
(8) Muenchen 90
Tegernseer Landstrasse 300
West Germany
Phone: (089) 690-70-52
Telex: W.Ger-52-81-08

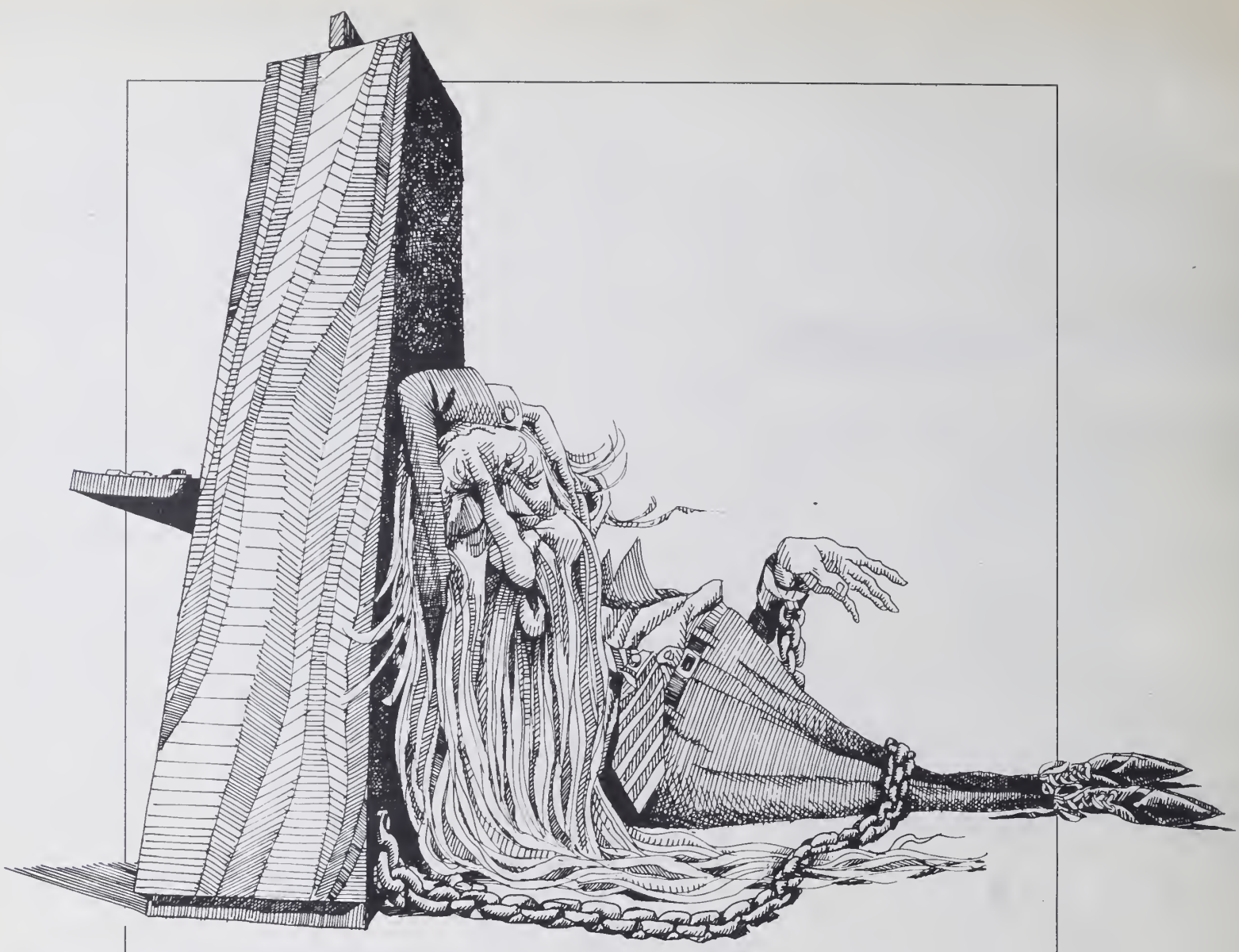
# Computerworld Stock Trading Summary

TRADE*QUOTES

All statistics compiled, computed and formatted by TRADE★QUOTES, INC. Cambridge, Mass. 02139

| EXCH | | 1974 RANGE (1) | CLOSE NOV 14 1974 | WEEK NET CHNGE | WEEK PCT CHNGE |
|---|---|---|---|---|---|
| | **COMPUTER SYSTEMS** | | | | |
| N | BURROUGHS CORP | 63-217 | 80 7/8 | -3 1/8 | -3.7 |
| O | COMPUTER AUTOMATION | 3- 14 | 2 7/8 | - 5/8 | -17.8 |
| N | CONTROL OATA CORP | 13- 38 | 13 1/8 | -3 1/4 | -19.8 |
| N | OATA GENERAL CORP | 13- 38 | 16 3/4 | -2 1/4 | -11.8 |
| O | OATAPOINT CORP | 7- 15 | 6 1/2 | -1 1/4 | -16.1 |
| O | OIGITAL COMP CONTROL | 2- 5 | 2 | - 1/8 | -5.8 |
| N | OIGITAL EQUIPMENT | 51-121 | 61 1/8 | -4 1/8 | -6.3 |
| N | ELECTRONIC ASSOC. | 2- 3 | 1 3/4 | + 1/4 | +16.6 |
| A | ELECTRONIC ENGINEER. | 5- 11 | 6 | - 1/8 | -2.0 |
| N | FOXBORO | 19- 48 | 26 1/2 | - 3/4 | -2.7 |
| O | GENERAL AUTOMATION | 9- 40 | 9 1/4 | -2 1/4 | -19.5 |
| O | GRI COMPUTER CORP | 1- 2 | 1/4 | 0 | 0.0 |
| N | HEWLETT-PACKARO CO | 58- 90 | 58 | -6 1/8 | -9.5 |
| N | HONEYWELL INC | 22- 86 | 23 3/4 | -1 1/4 | -5.0 |
| N | IBM | 152-251 | 182 1/8 | -5 1/8 | -2.7 |
| O | INTEROATA INC | 8- 22 | 13 5/8 | - 5/8 | -4.3 |
| O | MICROOATA CORP | 2- 5 | 1 3/4 | - 3/8 | -17.6 |
| N | NCR | 17- 40 | 17 3/8 | - 5/8 | -3.4 |
| N | RAYTHEON CO | 21- 39 | 26 1/8 | - 3/4 | -2.7 |
| N | SINGER CO | 12- 40 | 13 3/8 | + 1/4 | +1.9 |
| N | SPERRY RAND | 24- 44 | 28 1/4 | - 1/2 | -1.7 |
| A | SYSTEMS ENG. LABS | 1- 3 | 1 1/4 | 0 | 0.0 |
| N | TEXAS INSTRUMENTS | 60-115 | 75 7/8 | -1 3/4 | -2.2 |
| O | ULTIMACC SYSTEMS INC | 1- 2 | 1 | + 1/4 | +33.3 |
| N | VARIAN ASSOCIATES | 6- 13 | 7 1/2 | 0 | 0.0 |
| N | WANG LABS. | 7- 20 | 9 3/8 | - 5/8 | -6.2 |
| N | XEROX CORP | 61-127 | 65 3/4 | - 3/4 | -1.1 |
| | **LEASING COMPANIES** | | | | |
| O | BRESNAHAN COMP. | 2- 2 | 2 1/8 | 0 | 0.0 |
| O | COMOISCO INC | 1- 7 | 1 | - 1/4 | -20.0 |
| A | COMMERCE GROUP CORP | 3- 6 | 2 3/4 | 0 | 0.0 |
| O | COMPUTER EXCHANGE | 1- 1 | 1/8 | 0 | 0.0 |
| A | COMPUTER INVSTRS GRP | 1- 4 | 3/4 | + 1/8 | +20.0 |
| O | COMP. INSTALLATIONS | 1- 1 | 1/4 | 0 | 0.0 |
| M | OATRONIC RENTAL | 1- 1 | 7/8 | - 1/8 | -12.5 |
| A | OCL INC | 0- 1 | 1/4 | - | -16.5 |
| N | OPF INC | 2- 5 | 3 | + 1/8 | +4.3 |
| O | EOP RESOURCES | 2- 3 | 3 1/4 | 0 | 0.0 |
| A | GRANITE MGT | 1- 3 | 1 1/4 | + 3/8 | +42.8 |
| A | GREYHOUND COMPUTER | 2- 6 | 2 1/2 | 0 | 0.0 |
| A | ITEL | 3- 6 | 4 1/2 | - 1/8 | -2.7 |
| N | LEASCO CORP | 5- 12 | 7 1/4 | - 7/8 | -10.7 |
| O | LEASPAC CORP | 0- 2 | 5/8 | 0 | 0.0 |
| O | LECTRO MGT INC | 1- 1 | 1/8 | 0 | 0.0 |
| O | NRG INC | 1- 5 | 1 5/8 | - 5/8 | -27.7 |
| A | PIONEER TEX CORP | 2- 10 | 2 1/2 | - 1/4 | -9.0 |
| A | ROCKWOOO COMPUTER | 1- 1 | 1/2 | 0 | 0.0 |
| N | U.S. LEASING | 5- 24 | 11 | - 1/2 | -4.3 |
| | **SOFTWARE & EOP SERVICES** | | | | |
| O | AOVANCEO COMP TECH | 1- 2 | 3/4 | 0 | 0.0 |
| A | APPLIEO OATA RES. | 1- 3 | 1 1/4 | 0 | 0.0 |
| O | APPLIEO LOGIC | 1- 1 | 1/8 | 0 | 0.0 |
| N | AUTOMATIC OATA PROC | 21- 57 | 31 1/2 | -2 3/8 | -7.0 |
| O | BRANOON APPLIED SYST | 1- 1 | 1/4 | 0 | 0.0 |
| O | CENTRAL OATA SYSTEMS | 4- 6 | 3 | 0 | 0.0 |
| O | COMPUTER OIMENSIONS | 1- 3 | 1 3/4 | + 1/4 | +16.6 |
| O | COMPUTER HORIZONS | 1- 5 | 1 1/4 | 0 | 0.0 |
| O | COMPUTER NETWORK | 1- 2 | 1/2 | - 1/2 | -50.0 |
| N | COMPUTER SCIENCES | 2- 4 | 2 1/4 | - 1/8 | -5.2 |
| O | COMPUTER TASK GROUP | 1- 1 | 3/8 | - 1/8 | -25.0 |
| O | COMPUTER TECHNOLOGY | 1- 1 | 1/2 | 0 | 0.0 |
| O | COMPUTER USAGE | 2- 4 | 2 1/2 | - 1/4 | -9.0 |
| O | COMRESS | 1- 1 | 1/4 | 0 | 0.0 |
| O | COMSHARE | 2- 4 | 2 3/4 | + 3/8 | +15.7 |
| N | COROURA CORP | 1- 4 | 1 3/8 | 0 | 0.0 |
| O | OATATAB | 1- 3 | 1 1/8 | 0 | 0.0 |
| A | ELECT COMP PROG | 1- 1 | 1/4 | 0 | 0.0 |
| N | ELECTRONIC OATA SYS. | 11- 25 | 14 1/4 | - 3/4 | -5.0 |
| O | INFONATIONAL INC | 1- 2 | 3/8 | 0 | 0.0 |
| O | I.O.A. OATA CORP | 1- 1 | 1/4 | 0 | 0.0 |
| O | IPS COMPUTER MARKET. | 1- 1 | 1/2 | 0 | 0.0 |
| O | KEANE ASSOCIATES | 2- 4 | 1 3/4 | 0 | 0.0 |
| O | KEYOATA CORP | 1- 6 | 1 7/8 | 0 | 0.0 |
| O | LOGICON | 2- 5 | 2 1/2 | 0 | 0.0 |
| A | MANAGEMENT OATA | 1- 2 | 1 1/4 | + 1/8 | +11.1 |
| O | NATIONAL CSS INC | 6- 37 | 6 | -1 | -14.2 |
| O | NATIONAL COMPUTER CO | 1- 1 | 1/4 | 0 | 0.0 |
| A | ON LINE SYSTEMS INC | 18- 30 | 18 1/8 | -1 3/4 | -8.8 |
| N | PLANNING RESEARCH | 2- 3 | 2 1/4 | 0 | 0.0 |
| O | PROGRAMMING & SYS | 1- 1 | 3/4 | + 1/8 | +20.0 |
| O | RAPIOATA INC | 1- 5 | 1 7/8 | - 1/4 | -11.7 |
| O | SCIENTIFIC COMPUTERS | 1- 1 | 1 | + 1/8 | +14.2 |
| O | SIMPLICITY COMPUTER | 1- 1 | 1/2 | - 1/8 | -20.0 |
| O | TCC INC | 1- 1 | 1/8 | 0 | 0.0 |
| O | TYMSHARE INC | 6- 12 | 7 1/4 | - 3/8 | -4.9 |
| O | UNITEO OATA CENTER | 2- 4 | 2 1/2 | - 3/8 | -13.0 |
| A | URS SYSTEMS | 2- 4 | 2 | 0 | 0.0 |
| N | WYLY CORP | 2- 5 | 2 | + 1/8 | +6.6 |
| | **PERIPHERALS & SUBSYSTEMS** | | | | |
| N | ADORESSOGRAPH-MULT | 4- 11 | 4 3/8 | - 1/8 | -2.7 |
| O | AOVANCEO MEMORY SYS | 1- 7 | 1 1/2 | - 1/4 | -14.2 |
| N | AMPEX CORP | 3- 5 | 3 1/8 | - 1/8 | -3.8 |
| O | ANOERSON JACOBSON | 2- 4 | 2 | 0 | 0.0 |
| O | BEEHIVE MEOICAL ELEC | 2- 7 | 2 7/8 | 0 | 0.0 |
| A | BOLT,BERANEK & NEW | 5- 9 | 5 | - 5/8 | -11.1 |
| N | BUNKER-RAMO | 4- 8 | 4 1/2 | - 1/8 | -2.7 |
| A | CALCOMP | 5- 11 | 5 5/8 | - 3/8 | -6.2 |
| O | CAMBRIOGE MEMORIES | 4- 16 | 4 5/8 | -1 1/4 | -21.2 |
| O | CENTRONICS OATA COMP | 7- 23 | 12 | + 1/2 | +4.3 |
| O | COOEX CORP | 8- 15 | 14 | -1 1/4 | -8.1 |
| O | COGNITRONICS | 1- 2 | 5/8 | 0 | 0.0 |
| O | COMPUTER COMMUN. | 1- 2 | 1/2 | 0 | 0.0 |
| A | COMPUTER EQUIPMENT | 1- 2 | 1 1/4 | + 1/8 | +11.1 |
| O | COMPUTER MACHINERY | 1- 5 | 2 | - 1/2 | -20.0 |
| O | COMPUTER TRANSCEIVER | 1- 2 | 3/4 | - 1/8 | -14.2 |
| N | CONRAC CORP | 10- 22 | 13 5/8 | + 3/8 | +2.8 |
| O | OATA ACCESS SYSTEMS | 2- 3 | 2 1/2 | 0 | 0.0 |
| O | OATA 100 | 5- 13 | 6 3/8 | - 1/8 | -1.9 |
| A | OATA PROOUCTS CORP | 3- 4 | 2 7/8 | + 1/8 | +4.5 |
| O | OATA RECOGNITION | 1- 1 | 1/4 | 0 | 0.0 |
| O | OATA TECHNOLOGY | 2- 4 | 1 3/4 | - 1/8 | -6.6 |
| O | OECISION OATA COMPUT | 3- 13 | 3 7/8 | - 1/8 | -3.1 |
| O | OELTA OATA SYSTEMS | 1- 2 | 5/8 | 0 | 0.0 |
| O | OI/AN CONTROLS | 1- 2 | 1/2 | 0 | 0.0 |
| N | ELECTRONIC M & M | 2- 4 | 1 1/2 | - 1/8 | -7.6 |
| O | FABRI-TEK | 1- 3 | 5/8 | 0 | 0.0 |
| O | GENERAL COMPUTER SYS | 1- 4 | 2 | - 1/4 | -11.1 |
| N | GENERAL ELECTRIC | 30- 65 | 37 1/2 | -1 7/8 | -4.7 |
| N | HAZELTINE CORP | 3- 7 | 2 7/8 | - 3/8 | -11.5 |
| O | INFOREX INC | 2- 5 | 2 | - 1/8 | -5.8 |
| O | INFORMATION OISPLAYS | 1- 1 | 1/8 | 0 | 0.0 |
| O | INFORMATION INTL INC | 6- 14 | 7 1/4 | - 1/2 | -6.4 |
| A | LUNOY ELECTRONICS | 3- 3 | 2 7/8 | 0 | 0.0 |
| O | MANAGEMENT ASSIST | 1- 1 | 1/8 | 0 | 0.0 |
| N | MEMOREX | 2- 5 | 2 7/8 | + 1/8 | +4.5 |
| A | MILGO ELECTRONICS | 6- 18 | 8 1/4 | - 1/2 | -5.7 |
| N | MOHAWK OATA SCI | 1- 4 | 1 3/4 | + 1/4 | +16.6 |
| O | OOEC COMPUTER SYST. | 1- 3 | 1 | 0 | 0.0 |
| O | OPTICAL SCANNING | 3- 6 | 2 3/8 | 0 | 0.0 |
| O | PERTEC CORP | 2- 6 | 2 | 0 | 0.0 |
| A | POTTER INSTRUMENT | 1- 5 | 1 5/8 | - 5/8 | -27.7 |
| O | PRECISION INST. | 1- 3 | 3/4 | 0 | 0.0 |
| O | QUANTOR CORP | 2- 8 | 2 1/2 | - 1/4 | -9.0 |
| O | RECOGNITION EQUIP | 2- 5 | 2 3/8 | - 3/8 | -13.6 |
| N | SANOERS ASSOCIATES | 2- 8 | 2 3/4 | - 1/4 | -8.3 |
| O | SCAN OATA | 1- 2 | 1 | + 1/8 | +14.2 |
| O | STORAGE TECHNOLOGY | 7- 15 | 7 1/2 | -1 1/4 | -14.2 |
| O | SYCOR INC | 4- 13 | 5 3/4 | - 1/2 | -8.0 |
| O | TALLY CORP. | 1- 4 | 1 3/8 | - 1/8 | -8.3 |
| O | TEC INC | 2- 7 | 2 1/2 | 0 | 0.0 |
| N | TEKTRONIX INC | 21- 48 | 22 | -1 1/2 | -6.3 |
| N | TELEX | 3- 4 | 3 3/8 | - 1/4 | -6.8 |
| O | WANGCO INC | 5- 13 | 4 1/2 | - 3/8 | -7.6 |
| O | WILTEK INC | 2- 8 | 1 3/4 | 0 | 0.0 |
| | **SUPPLIES & ACCESSORIES** | | | | |
| O | BALTIMORE BUS FORMS | 4- 6 | 4 1/2 | - 1/4 | -5.2 |
| A | BARRY WRIGHT | 4- 7 | 4 1/2 | 0 | 0.0 |
| O | CYBERMATICS INC | 1- 2 | 5/8 | + 1/8 | +25.0 |
| A | OATA OOCUMENTS | 23- 54 | 34 | -5 7/8 | -14.7 |
| O | OUPLEX PROOUCTS INC | 6- 17 | 14 5/8 | - 3/4 | -4.8 |
| N | ENNIS BUS. FORMS | 4- 7 | 4 7/8 | - 1/4 | -4.8 |
| O | GRAHAM MAGNETICS | 6- 11 | 6 3/4 | - 1/4 | -3.5 |
| O | GRAPHIC CONTROLS | 6- 11 | 8 3/4 | -1 | -10.2 |
| N | 3M COMPANY | 47- 79 | 57 | -3 | -5.0 |
| O | MOORE CORP LTO | 33- 57 | 40 1/2 | -1 | -2.4 |
| N | NASHUA CORP | 24- 45 | 26 3/8 | - 3/8 | -1.4 |
| O | REYNOLOS & REYNOLO | 8- 35 | 9 1/2 | -1 1/2 | -13.6 |
| O | STANOARO REGISTER | 10- 16 | 13 1/2 | 0 | 0.0 |
| O | TAB PROOUCTS CO | 5- 11 | 6 | 0 | 0.0 |
| N | UARCO | 13- 23 | 19 3/4 | - 1/4 | -1.2 |
| A | WABASH MAGNETICS | 3- 7 | 3 3/4 | 0 | 0.0 |
| N | WALLACE BUS FORMS | 14- 24 | 15 3/8 | - 7/8 | -5.3 |

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIOWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST OOLLAR



# If you only need a computer for 3 years. you shouldn't have to settle for more.

If your company isn't quite ready for a long term computer relationship, look into ITEL's short term IBM 370 system lease.

It's a two- or three-year packaged operating lease that lets you keep your freedom and conserve capital at the same time.

For example, ITEL will lease you an IBM 370 central processing unit, plus ITEL's 7330 disk subsystem and ITEL memory at up to 40% savings over IBM's rental on an equivalent system.

Who's behind this good news?

The people who pioneered IBM 370 financial packaged leases. The same people who have over half a billion dollars in IBM computer leasing experience.

**Your financial alternative.** ITEL CORPORATION DATA PRODUCTS GROUP

One Embarcadero Center, San Francisco, California 94111, Phone: (415) 983-0000